VarioCAM® hr head

incl. IRBIS® remote 3.0 software description

User Manual

Last reviewed: December 2012

InfraTec GmbH
Infrarotsensorik und Messtechnik
Gostritzer Straße 61 – 63
01217 Dresden/GERMANY

Phone +49 351 871-8615
Fax +49 351 871-8727
E-mail service@InfraTec.de
www.InfraTec.de

Table of Contents

1 Introduction

Dear User,

Congratulations on the purchase of your new thermographic system VarioCAM® hr head.

Please read these instructions carefully before operating the system for the first time. This will enable you to make full use of the features of your new thermographic system. Please especially note the advice regarding device safety in Chapter 2 in order to avoid damage to the thermographic system.

All the specifications in this user manual describe a completely equipped thermographic system VarioCAM® hr of the "head" series. Technical data, the scope of features and accessories included in your thermographic system may deviate from the specifications described here depending on the model chosen and on individual adjustments. Features relating to optional equipment are marked ***** in this manual.

Principally, the description of technical data and the specific scope of features provided in the relevant shipping documents (confirmation of order/delivery note) apply.

Further development is subject to technical progress.

Jenoptik ESW GmbH
07745 Jena / GERMANY

InfraTec GmbH
01217 Dresden / GERMANY
Phone: +49 351 871-8615
Fax: +49 351 871-8727
E-mail: service@InfraTec.de

CE

VarioCAM® high resolution head (hereinafter VarioCAM® hr head) is a modern thermographic system for the precise, quick and non-contact measurement of surface temperatures of objects. Its compact and robust design and high degree of protection make it especially suitable for industrial applications even under unfavorable external conditions. Its low weight as well as its long battery life provide for its effective use.

A wide range of accessories and several software packages for handling images and their further processing make the VarioCAM® hr head a universal thermographic system for use in a wide field of applications.

Its high measuring precision, precision lenses of extraordinary imaging quality and its universal interface design for the digital recording of real-time thermographic data via FireWire/IEEE 1394* permit the application of the VarioCAM® hr head in the most varied fields of research and development.

Typical applications of the thermographic system include:

- Inspection of electrical and mechanical systems and power units
- Optimisation of components and units
- Control of process temperatures
- Quality assurance

2 Advice on Device Safety

General

The VarioCAM® hr head is a high-quality, thoroughly calibrated optical measuring instrument. Handle it with appropriate care. Avoid soiling it, particularly its optical surfaces.

The device has protection class IP 65.

Please observe the conditions specified under Technical Data (see Chapter 3.3, Technical Data, page 9) for use, save and transport of the device.

For transporting the VarioCAM® hr head, exclusively use the transportation case included.

Opening the camera case is reserved for customer service or authorised staff only. Any interference by the user or unauthorised persons is not permitted and will void any warranty.

Only use accessories or spare parts which are expressly recommended by JENOPTIK Laser, Optik, Systeme GmbH for use with the VarioCAM® hr head. Otherwise malfunctions or damage can occur. Warranty shall be excluded for such damage.

Standards, Guidelines

The VarioCAM® hr head complies with the requirements of the following standards:

- **EN 61010-1:2001** Safety requirements for electrical equipment for measurement, control and laboratory use – Part1: General requirements (IEC 61010-1:2011)
- **EN 61326-1:2006** Electrical equipment for measurement, control and laboratory use – EMC Requirements – Part1: General requirements (IEC 61326-1:2005)

Handling

The VarioCAM® hr head is equipped with a highly sensitive uncooled microbolometer detector. Object radiation occurring in thermographic practice does not cause any changes in the detector. However, black-body radiation overdrive exceeding 1,000 °C in measuring ranges 1 and 2 or 2,000 °C in measuring ranges 3 and 4, may result in irreversible damage and must therefore be avoided by selecting a suitable calibration range* prior to measuring.

The VarioCAM® hr head must, neither in operation nor when switched off, directly be focused into the sun or other sources of intensive radiation (e.g. lasers), since this may result in changes of the microbolometer detector, whose origin can unambiguously be proven. The manufacturer waives any warranty for such damage.

It is also imperative to avoid indirectly capturing any sunlight or other highly energetic radiation via reflective surfaces directed into the field of view of the VarioCAM® hr head!

Under certain conditions, it cannot be excluded, even when the system is switched off, that the detector may be damaged when directed into sunlight. Therefore, when the VarioCAM® hr head is not in use, the lens must be capped with the protective cover included.

Only use SecureDigital cards in the SD slot of the VarioCAM® hr head. Otherwise damage to the camera or the memory card can arise, for which no liability will be accepted.

Lens changes should not be carried out in rooms of high dust load or humidity, since IP 54 protection class is not guaranteed with the lens removed.

3 Technical Description

3.1 Operating Principle

The VarioCAM® hr head is a thermographic system for the **lo**ng **w**ave **i**nfra**r**ed spectral range (**LWIR**) of (7.5 ... 14) µm. The lens images the object scene onto a microbolometer array at a resolution of (640 x 480) or (384 x 288) pixels. The electrical signal of the detector arrays is further processed by the internal electronics. The electronics contains all the functions necessary for camera operation, such as activation of the microbolometer array, A/D conversion, offset and gain correction, defective pixel treatment, video and PC interfaces.

Operating the system is effected via the PC interfaces, available as FireWire (IEEE 1394) and RS232*. The use of these interfaces which are available depending on their versions of equipment requires special software packages. You will find relevant details from Chapter 8 on, Hardware and Software Installation for VarioCAM® hr head*, page 22.

3.2 Description of the Functional Units

Lens

The camera lens captures the IR radiation emitted by the object in the field of view and images it on the detector array. **F**ield **o**f **v**iew (**FOV**) and resolution/size of the measuring point (**IFOV**, **I**nstantaneous **F**ield **o**f **V**iew) are determined at the same distance from the focal length f of the lens used.

The following standard lenses are available:

Thermographic system of resolution (384 x 288) pixels

lens	**focal length (mm)**	**min. focus (m)**	**IFOV (mrad)**	**FOV (°)**
wide-angle lens	12.5	0.2	2.8	(57 x 44)
standard lens	25	0.3	1.4	(30 x 23)
telephoto lens 1	50	2.0	0.7	(15 x 12)
telephoto lens 2	75	2.0	0.47	(10 x 8)
telephoto lens 3	130	5.0	0.27	(6 x 4)
close-up lens	**focal length (mm)**	**focus (mm)**	**field of view (mm²)**	**resolution (µm)**
close-up 0.17x	for 25	149	(80 x 60)	209
close-up 0.5x	for 25	50	(27 x 20)	70
microscopic lens 1.0x	-	50	(13 x 10)	35

Thermographic system of resolution (640 x 480) pixels

lens	focal length (mm)	min. focus (m)	IFOV (mrad)	FOV (°)
wide-angle lens	12.5	0,2	2.0	(65 x 51)
standard lens	30	0,3	0.8	(30 x 23)
telephoto lens 1	50	2,0	0.5	(18 x 14)
telephoto lens 2	75	2,0	0.3	(12 x 9)
telephoto lens 3	130	5,0	0.2	(7 x 5)
close-up lens	**focal length (mm)**	**focus (mm)**	**field of view (mm²)**	**resolution (µm)**
close-up 0.17x	for 30	150	(80 x 60)	125
close-up 0.5x	for 30	50	(27 x 20)	42
microscopic lens 1.0x	-	50	(16 x 12)	25

Detector

The VarioCAM® hr head has an uncooled microbolometer FPA detector (uncooled **F**ocal **P**lane **A**rray). The detector is thermally stabilised with high precision using a Peltier element and is thus independent of the ambient temperature.
The various elements of the detector are microscopically minute thin-film resistors on wafer-thin membranes, which are arranged cantilevered a few micrometers above the silicon read-out circuit. The thermal radiation of the scene is imaged by the lens of the thermographic system on these detector elements and absorbed by them. The temperature change of the detector elements resulting therefrom yields electronically evaluable signals which can be read out line-wise and column-wise by a read-out circuit.

Applying an uncooled detector guarantees quick availability of the camera function after switching it on (start-up time < 60 seconds) and long service life (MTTF) in permanent use.

Detector electronics

The detector electronics supplies the BIAS voltages required for detector operation and further control signals, and it takes care of the pre-processing and digitalisation of the analog video output signal from the detector.

Image processing electronics

Real-time image processing with the following essential functions (depending on the equipment) is implemenmted with the help of an **FPGA** (**F**ield **P**rogrammable **G**ate **A**rray) and an **embedded PC** (modular compact internal PC):

- Detector electronics interface
- Gain and offset correction
- Defective pixel treatment
- Low-pass filtering
- Zoom generator
- Graphic overlay
- FireWire (IEEE 1394) interface
- Embedded PC interface
- Standard-format video-image generator (PAL/NTSC-FBAS, S-Video, RGB)

Opto-mechanics

The following functions are performed with the help of the opto-mechanics assembly group:

- Focussing (motor focus)
- Effective range change-over (lens apertures)*
- Internal **NUC** (**N**on **U**niformity **C**orrection) using an internal shutter

Furthermore, this assembly group has an optional module for a hardware-based increase of geometric resolution of the thermographic system onto (768 x 576) IR pixels (detector of [384 x 288] pixels) and onto (1,280 x 960) IR pixels (detector of [640 x 480] pixels): mode “Resolution Enhancement”*. The opto-mechanics can be modified for reducing the minimal focus distance*.

Controls

VarioCAM® hr head is mainly designed for stationary applications. For those case of operation the camera is operated from a host computer, via the FireWire (IEEE 1394)-Interface of the device. The relevant operating software is also described in Chapter 8 Hardware and Software Installation for VarioCAM® hr head* – page 22.

Power supply

The VarioCAM® hr head has the following power supply options:

- External power supply unit 12 V*
- FireWire (IEEE 1394) interface*.

The mains adapter is connected to the 14-pin (left) socket at the rear of the camera.

For devices equipped with a FireWire (IEEE 1394) interface, the supply voltage can be taken directly from the PC interface card. Please note the specification of the used interface card and the power input of the thermographic system. In case of cable lengths > 5 m, power should principally be supplied via the external power supply unit or the rechargeable battery.

Interfaces

The thermographic system has the following interfaces:

- Composite Video, S Video, VGA
- Input for external trigger signal/trigger output* (TTL/CMOS, 5 V)
- FireWire (IEEE 1394)
- RS232*
- Headset socket

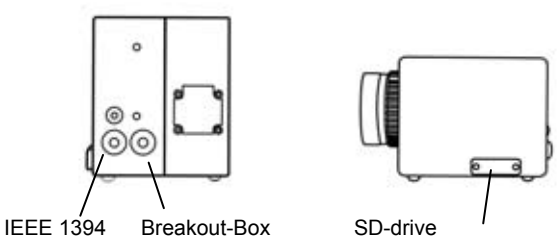


Abb. 1: Camera-Interface

With the exception of FireWire (IEEE 1394), Headset and WLAN, parallel use of all interfaces is possible by means of a Breakout Box. The Breakout Box* is connected to the thermographic system with a 14-pin system cable*. Voltage is then supplied to the Breakout Box from the external power supply unit*. The analog image information is available as Composite Video, S-Video or VGA signal. Suitable monitors can be connected to the Breakout Box with standard cables (see Chapter 7.6, Operation with Breakout Box (Connection via RS232)*, p. 19).

The FireWire (IEEE 1394) interface*, in connection with the software packages IRBIS® remote* and IRBIS® online*, permits to remote-control the thermographic system and the real-time transfer* of digital image information to a PC.

3.3 Technical Data

Spectral range	(7.5 ... 14) µm
Temperature measuring range	(-40 ... 1,200) °C, optional > 2,000 °C
Temperature resolution @ 30 °C	better than 0.05 K, up to 0.03 K
Measurement accuracy	± 1.5 K (0 ... 100) °C; ± 2 % (< 0 and > 100) °C
Emissivity	Adjustable from 0.1 to 1.0, in increments of 0.01
Recording, image format (pixels)	Focal Plane Array , (320 x 240) or (384 x 288), Resolution Enhancement onto (768 x 576) (640 x 480), Resolution Enhancement onto (1,280 x 960)
Detector	uncooled microbolometer Focal Plane Array
IR frame rate	50/60 Hz
Standard lens (field of view)	1.0/25 mm (25 x 19)° at (320 x 240) 1.0/25 mm (30 x 23)° at (384 x 288) 1.0/30 mm (30 x 23)° at (640 x 480)
Zoom function	Up to 8 times digital, infinitely variable
A/D conversion	16 bit
Image memory	SD card, FireWire (IEEE 1394) up to 50/60 Hz, internal real-time storage
Interfaces	PAL/NTSC-FBAS, S Video, VGA, RS232, WLAN FireWire (IEEE 1394), Headset
Power supply	mains adapter, FireWire (IEEE 1394)
Operation temperature	(-15 ... 50) °C
Storage temperature	(- 40 ... 70) °C
Humidity during operation and storage	relative humidity 5 % to 95 %, non-condensing
Dimensions (complete system)	(133 x 106 x 110) mm
Weight (complete system)	approx. 1.3 kg
Tripod recepticle	1/4" screw thread **Warning: observe max. screw-in depth of 4.5 mm! (DIN 4503)**
Display functions	thermogram, operator-guided, menu, results, status
Measurement functions	max. 10 freely selectable ROI, auto hot/cold spot display, isotherms
Automatic functions	autofocus, autoimage, autolevel, alarm,
Protection class in operation	IP 65, IEC 529
Shock resistance	25 G, IEC 68-2-29
Vibration resistance in operation	2 G, IEC 68-2-6

* (Properties and technical specifications are dependent on the camera configuration and vary in the equipment packages VarioCAM® hr head. Design and specifications are subject to permanent improvement; subject to changes in the sense of technical progress.)

4 Unpacking and Checking

Upon receipt of the VarioCAM® hr head, please check for its completeness and that components are not damaged. The supplier must immediately be informed of any damage.

The VarioCAM® hr head system comes in an equipment carrier case or in transport packaging.

The basic package contains the following components:

- Thermographic camera VarioCAM® hr head with lens
- Protective lens cover
- External power supply unit (12 V DC) with 14- pin LEMO plug, adapter Lemo 14- pin onto 6- pin
- User manual VarioCAM® hr head
- Brief instructions
- Equipment carrier case / transport packaging
- FireWire (IEEE 1394) PCI card
- FireWire (IEEE 1394) cable, 6- pin or 4- pin

Optional accessories*

- Various lenses, close-up rings
- Lens-protecting apertures, laser-protection filters
- SecureDigital card
- Card adapter for SD card
- Breakout Box, system cable, 14- pin, trigger cable
- LWL interface for FireWire (IEEE 1394)
- Tripod for device
- Thermographic software of the IRBIS® programme family

5 Description of Camera Parts

LEMO socket, 6-pole for:

(marked yellow)

- FireWire (IEEE 1394) cable
- Power supply unit with adapter

LEMO socket, 14-pin for:

- Power supply unit without adapter
- FBAS cable
- Breakout Box (via system cable)
- Universal cable (RS 232, FBAS, S video)

Fig. 2 Side view

SD card slot

Lens

Fig. 3 Front view

6 Quick Start

The following instructions shall help to quickly familiarise with operating the VarioCAM® hr head. For obtaining professional results, we recommend to carefully read the entire manual.

6.1 Preparation

You require the following equipment:

- VarioCAM® hr head 
- Power supply unit* with LEMO plug 
- IRBIS® software 
- SD card reader* 
- SD card* 

(Product similar to diaplyed)

6.2 Installation Software IRBIS® remote

- To be able to handle the camera, the operating software IRBIS® remote has to be inastalles on the computer or notebook. The software indicates the measuring scenery taken up by the camera
- The operation of the VarioCAM® hr head occurs via the “Remote control“ of the software IRBIS® remote. Navigate in the main menu with the buttons ↑, ↓, ←, → and choose the functions with **E**nter.

Abb. 4 Die Bedienung der Kamera erfolgt über das Bedienfenster der IRBIS® Software

6.3 Start

- Conect the camera to a PC or Notebook. Remove **lens protective cover**.
- Connect the external power supply unit to the VarioCAM® hr head (14- pin plug into left socket, with the red indication showing upwards) to set the electrical power supply. After system initialisation, the **Operating LED**, initially flashing green, subsequently turning to permanent green, signals that the VarioCAM® hr head is ready for operation
- Start the software, connect the camera with the software and open the “”Remote Control” window to operate the camera in the camera-menu.
- Remove cover from SD card slot, insert **SD card** into card slot and return cover.

6.4 Display

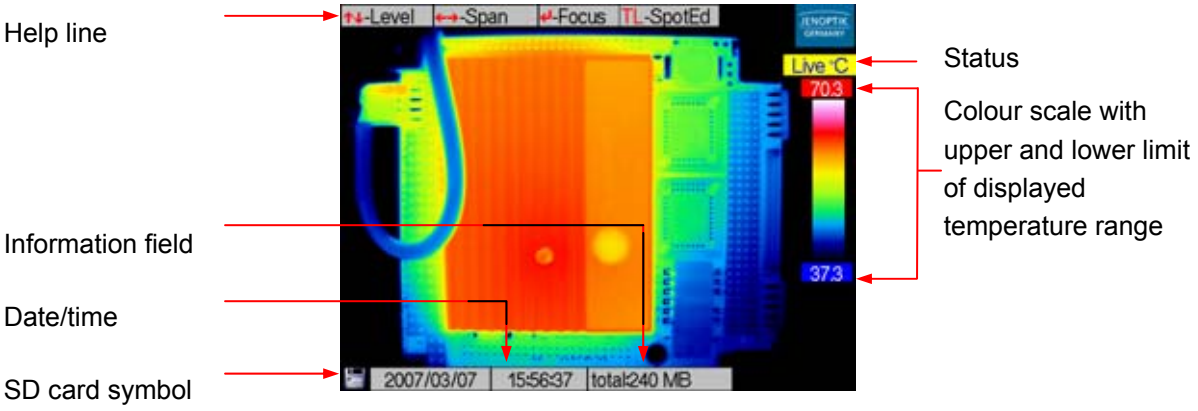


Fig. 5 Camera menu in live mode

- At first, select to view a scene rich in contrast (e.g. an active electrical device) and focus the VarioCAM® hr head onto it.
- Adjust the viewfinder to your eye by using the Remote control of the software. For optimal adjustment, relate to the sharpness of the lettering.

6.5 Image Optimisation

- Press the button **AL**. The thermographic system automatically focuses and the temperature scaling of the false-colour image is automatically optimised according to the current scene.

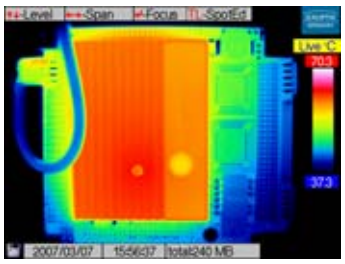


Fig. 6 Camera menu in live mode

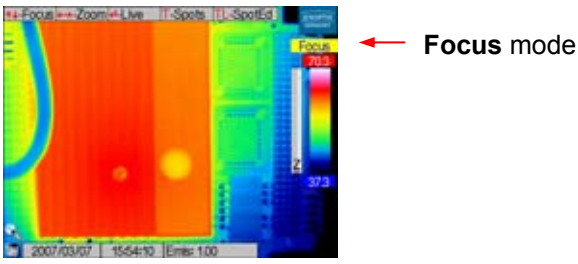
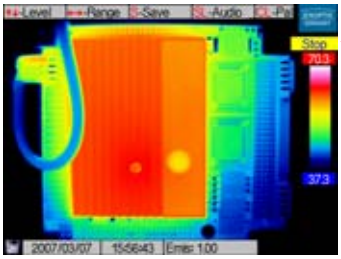


Fig. 7 Camera menu in focus mode

- In the live mode, button movements ↑, ↓ change the selected temperature level and button movements ←, → change the selected temperature range.
- Pressing the **E**nter button switches between the live mode and the focus mode.
- In the focus mode, buttons ↑, ↓ focus over larger or shorter **distances to the object**.

6.6 Data Storage

- For **Storage** of the thermal image press the **S** button. The live image freezes, i.e. camera goes into stop mode.



Stop mode

Fig. 8 Camera menu in stop mode

- Pressing the **S** button again saves the thermal image on the SD card. Pressung the **C** button interrupts the saving process. The camera will return to the live mode after the saving process.

When using the button **SL**, the camera saves a thermogram without changing into the stop mode in between.

6.7 Menu Functions

- VarioCAM® hr head offers a variety of analytical and automatic features. The settings and functions are selected in the main menu of the software which can be accessed by using the remote control function..

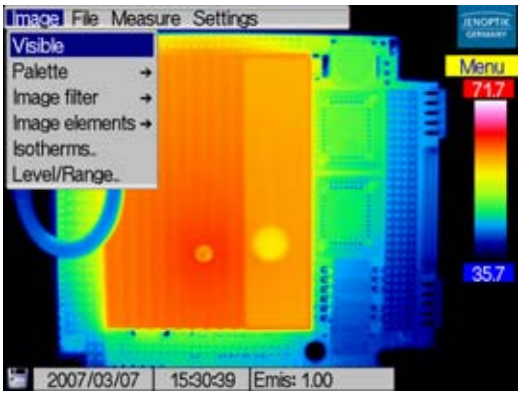


Fig. 9 Camera menu

- You navigate in the main menu by moving the buttons ↑, ↓, ←, → and select the functions by pressing **E**nter.

6.8 Switching OFF

- The camera is switched off as soon as the electricity supply is interrupted to the camera.

6.9 Data Transfer to the Computer

- For data transfer via the **FireWire (IEEE 1394)** interface with the help of IRBIS® remote/online, this software (which comes included if rewquested for) should at first be installed following the description in the respective manual.
- Another method of the data transfer is the readout of the SD-card with a cardreader.

6.10 Evaluation with Analysing Software IRBIS®

- Install the analysing software IRBIS® on the computer and start it.
- From menu **"File"**, select submenu **"Open..."** and open the desired thermograms (*.irb files).
- From menu **"Thermogram"**, submenu **"Palette",** select the desired colour palette.
- Via menu **"View"**, you can display further image elements, measurement data, annotations and parameters in addition to the thermogram.
- By pressing the right mouse key on the colour scale, the dialogue **"Level/Range"**, where the temperature level and range can be adjusted as desired by moving the scroll bar. The adjustment is also adopted for subsequent thermal images.
- With the help of the respective functional buttons on the symbol bar, points of measurement, areas, etc. as well as the display of temperature maximum and minimum can be activated.
- For inserting the analysed thermal images into your **reports**, select the function "Copy to clipboard" in the "Edit" menu. You can also use the report generator.

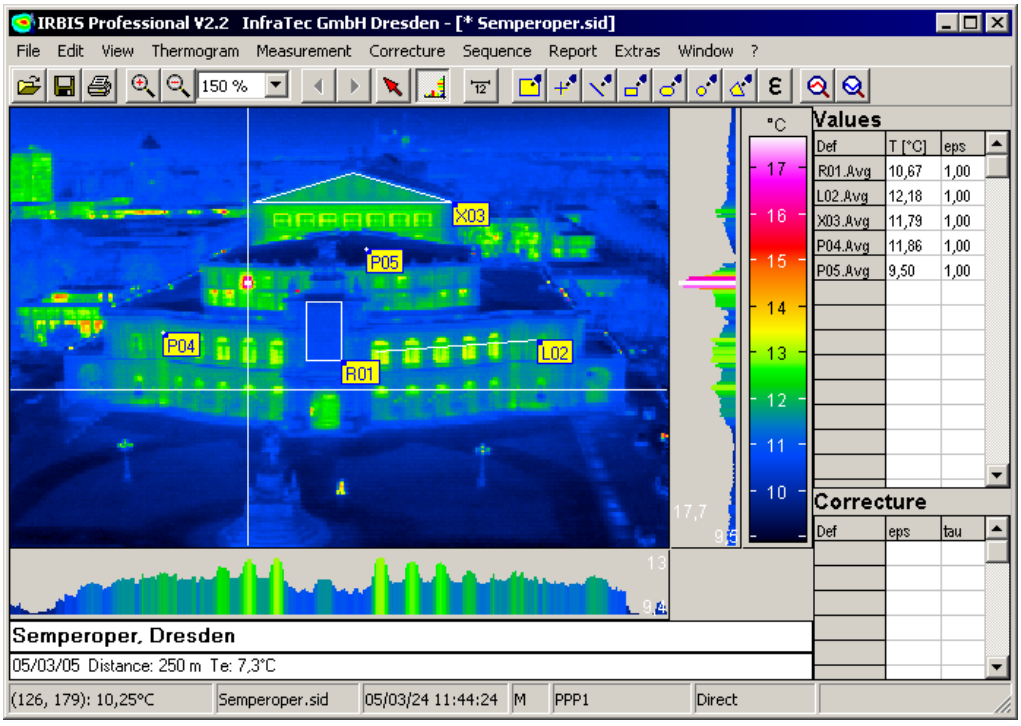


Fig. 10 IRBIS® Software

7 Starting up

7.1 Using a Tripod*

For this purpose, the thermographic camera has a 1/4" tripod threat (DIN 4503) at the bottom. The installation of the VarioCAM® hr head on a tripod (optional accessory) is recommended for blur-free camera exposures, especially when using the Resolution Enhancement mode.

Please note the maximum screw-in depth of the photo thread of 4.5 mm (DIN 4503).

7.2 Connecting the Power Supply

The external power supply unit* is connected to the 14- pin socket situated on the left rear of the thermographic system.

7.3 Inserting a Memory Card

The SD card slot is located on the left of the camera. It is protected by a cover to guarantee its IP 65 protection class. In order to insert the memory card, remove the cover and put the card into the slot. Please ensure the correct orientation of the card (▲ to the top). Then cover the slot again. This is compulsory to maintain the full protection class of the device.

7.4 Lens Replacement

Only perform replacement of lenses in dry and as dust-free as possible environment. With the lens removed, the system's IP 65 protection class is not guaranteed!

Place the VarioCAM® hr head on a solid, plane base with the lens facing to you. Turn the lens-fastening ring clockwise until it stops (approx. 145°) and remove the lens to the front.

For fixing the lens, the red markings on the lens, on the lens-fastening ring and on the camera must be aligned. The lettering on the lens will then face up. In this position, the lens is gently pushed against the corpus of the camera; the lens-fastening ring is unlocked and automatically turns to the right. Finally, the lens-fastening ring is fully locked by gently pushing it to the right.

7.5 Operation via the FireWire (IEEE 1394) Interface*

By means of the following connecting options, the VarioCAM® hr head can be connected to the PC/notebook. The accessories described are optionally included in the scope pf delivery*.

Please follow the instructions, i.e. always plug the FireWire cable into the computer first and then connect it to the camera!

Fig. 11 FireWire (IEEE 1394) cable, 6-pin

1) The 6-pin FireWire cable is used for making a connection to the FireWire interface of the **PC**.

Fig. 12 FireWire (IEEE 1394) cable, 4-pin

1a) The 4-pin FireWire cable* is used for making the connection to a **notebook**.
For this purpose, the 4-pin FireWire plug must be connected to the FireWire output integrated in the notebook (optionally a CardBus-FireWire card can be used).

Fig. 13 LEMO plug, 6-pin

2) The 6-pin LEMO plug (marked yellow) is connected to the 6-pin LEMO socket (Fig. 14, marked yellow) on the camera.

Fig. 14 LEMO socket, (14-pin left / 6-pin right)

Please take care to connect to the correct LEMO socket!

Plug the LEMO plug with the red dot showing on the upside into the socket. Do not use any force!

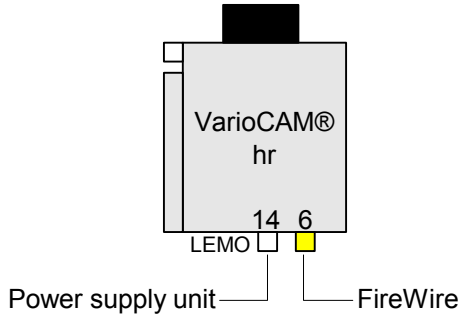


Fig. 15 VC hr withFireWire cable and power supply unit

VarioCAM® hr head with FireWire cable and power supply unit

The thermographic camera is connected via the FireWire cable with the 6-pin LEMO socket (right, marked yellow). The power supply unit power supply unit is connected on the left to the 14-pin LEMO socket.

When connecting the thermographic camera with the PC/notebook for the first time, automatic hardware recognition will be activated. Further steps for installing the FireWire (IEEE1394) driver for the VarioCAM® hr head are described in Chapter 8.3, Installation of the FireWire Driver for the VarioCAM® hr head, page 23.

Connection with a power supply unit*

Fig. 16 Power supply unit with plug

When operating the VarioCAM® hr head on a notebook (FireWire connection without any power supply), the thermographic system is to be connected via a power supply unit by means of the 14-pin LEMO plug.

Fig. 17 LEMO adapter

As an alternative, power can also be supplied via the 6-pin LEMO socket on the right at the rear of the VarioCAM® hr head or of the Breakout Box. For this purpose, the LEMO adapter is connected to the power supply unit.

Connection without a power supply unit

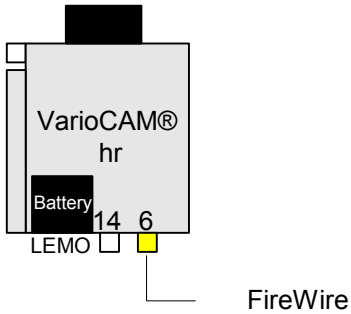


Fig. 18 VC hr with FireWire cable (and battery)

VC hr with FireWire cable (and battery)

The VarioCAM® hr head is connected via the FireWire cable with the 6-pin LEMO socket on the right (each marked yellow). The head is supplied with power via the battery or the FireWire cable. An external power supply unit is not required in this case.

Should the thermographic system VarioCAM® hr head be operated on a PC without any power supply unit (power supply via the FireWire interface), make sure that the FireWire cards recommended by InfraTec are used. Otherwise InfraTec will not grant any functional guaranty.

7.6 Operation with Breakout Box (Connection via RS232)*

The use of the Breakout Box extends the options of connection of the VarioCAM® hr head. The analog outputs PAL/NTSC-FBAS and S Video as well as the digital RS232 interface are accessible via the Breakout Box.

Please follow the instructions as provided for making the desired connection.

1. At first, connect the thermographic camera and Breakout Box. For this purpose use the included 14-pine system cable which is to be connected to the 14-pin (left) LEMO socket at the rear of the thermographic system.
2. Then connect the Breakout Box to the COM interface of the host PC.
3. Now the included power supply unit is connected to the Breakout Box.
4. The camera starts automaticly as soon as the power via the power supply unit is given.

Connection Breakout Box – Option 1

Fig. 19 Trigger Cable Breakout-Box – option 1

S-Video

Connection for system cable to the VarioCAM® hr head

Power supply, 12 V DC supply voltage

Fig. 20 Breakout Box (S-Video, camera connection, power supply)

Trigger T1, T2 (configurable)

Serial interface (RS232)

BNC video connection (PAL/NTSC-FBAS)

Fig. 21 Breakout Box (Trigger; RS232, BNC)

Connection Breakout Box – Option 2

Fig. 22 Trigger Cable Breakout-Box - Option 2

Power supply, 12 V DV supply voltage

Connection for system cable to the VarioCAM® hr head

Trigger input/trigger output

Fig. 23 Breakout Box – option 2 (power supply, camera connection, Trigger)

BNC video connection (PAL/NTSC-FBAS)

Serial interface (RS232)

S-Video

Fig. 24 Breakout Box – option 2 (BNC, RS232, S-Video)

7.7 Trigger Functionality VarioCAM® hr head

Triggering only affects the 16-bit data transmission via FireWire. A 14-core system cable transmits the TTL/CMOS-signal from the interfaces “T1” and “T2” on the Breakout Box to the VarioCAM® hr head. Use the included trigger cables in order to connect the Breakout Box, see Fig. 19 and Fig. 22.

- T1 Trigger channal 1 is used by software IRBIS® 3.
- T2 Trigger channal 2 is reserved for SDK and further specific applications.

The voltage level of the trigger signals from VarioCAM® hr head is 5 V TTL/CMOS at the input and output.

The VarioCAM® hr head reacts to low-high trigger edges. The trigger event effects a tagging of the FireWire header index of the next frame (IR image). This tag will be evaluated by the IRBIS® 3-implemented IRBGRAB.DLL, which will then save the respective data. The minimum length of the trigger signal is 10 ns. However, the impulse should not be shorter than approximately 3 ms in order to make for a precise assignment to the current frame. Nevertheless, a cadence with a duty cycle of 1:1 is also possible.

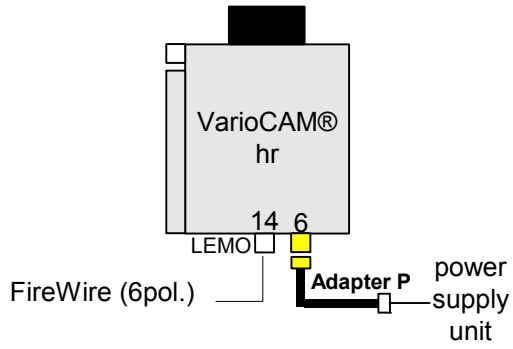


Fig. 25 VC hr with power supply unit and universal cable or Breakout Box (system cable)

VC hr FireWire-cable and universal cable

VarioCAM® hr head is connected to the Notebook via FireWire-cable (4pol.)/PC (6-pol.) to the 6-pin of the LEMO socket of the camera. The power supply is connected to the 14- pin of the LEMO socket of the VarioCAM® hr head via **adapter P**.

Adapter P (power supply adapter) is only to be used in connection with the power supply!

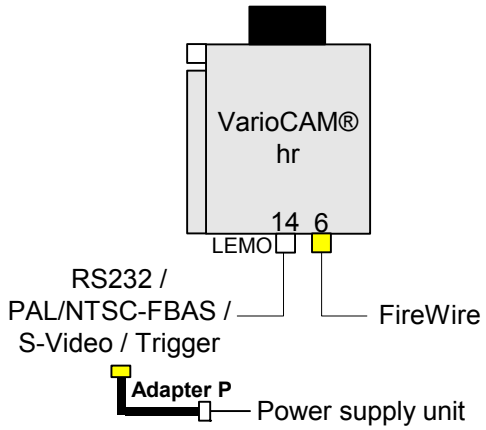


Fig. 26 VC hr with power supply unit, universal cable or Breakout Box (system cable)

VC hr with power supply unit, Breakout Box (with system cable) and FireWire

The VarioCAM® hr head is supplied with power via the power supply unit. For that purpose the 6-pin LEMO plug of the power supply is connected to the 6- pin LEMO socket of the VarioCAM® hr head. The universal cable can be connected to the 14-pin LEMO socket of the VarioCAM® hr head.

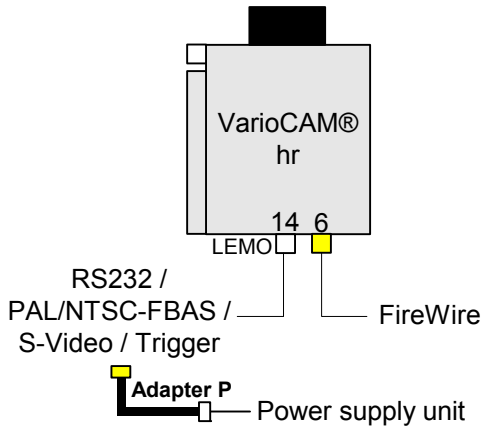


Fig. 27 VC hr with power supply unit, universal cable or Breakout Box (system cable)

VC hr with power supply unit, Breakout Box (with system cable) and FireWire

The Breakout Box is connected to the 14-pin LEMO socket of the VarioCAM® hr via the system cable. The VarioCAM® hr head is supplied with power via the power supply unit. For that purpose the 14-pin LEMO plug of the power supply is connected to the 6- pin LEMO socket of the Breakout Box via **Adapter P**. FireWire can be connected to the 6-pin LEMO socket on the right of the VarioCAM® hr.

Please note that the 6-pin LEMO socket of the Breakout Box exclusively serves the power supply and that it does not permit connection of the FireWire cable!

8 Hardware and Software Installation for VarioCAM® hr head*

8.1 Fundamentals

The special thermographic software IRBIS® remote and IRBIS® online help to link the infrared camera VarioCAM® hr head with a PC. It includes the following functions:

- Remote-control of camera functions and visualisation at the PC/notebook (IRBIS® remote/IRBIS® online)
- Real-time transfer, display and saving of digital thermographic measurement data on the control PC (IRBIS® online)

The following hardware interface is used for communication between the PC and the thermographic camera:

- FireWire (IEEE 1394) interface

By means of the FireWire (IEEE 1394) interface, the digital data stream continually provided by the infrared camera is recognised in an image-synchronous way and provided for the display, evaluation and saving within the repsective IRBIS® software.

The infrared camera VarioCAM® hr head provides the digital image information at a width of 16 bit via FireWire (IEEE 1394).

8.2 Hardware Components

Control and evaluation PC

A FireWire (OHCI IEEE 1394) interface card must be installed in the control PC. In order to guarantee safe connection with the thermographic system, exclusively use the IEEE 1394 interface card recommended by InfraTec or included in the package.

Components for digital data transfer and camera control

Notebook

Should the thermographic system VarioCAM® hr head be operated by a notebook, the thermographic system needs to be connected to an additional power supply. This can be a suitable Lithium-ion accumulator or the included DC power supply unit* (with 14-pin LEMO plug). The 4-pin FireWire (IEEE 1394) cable (see Fig. 12, FireWire (IEEE 1394) cable, 4-pin page 17) facilitates hardware connection between the internal mainboard IEEE 1394 interface of the notebook and the VarioCAM® hr head. The 6-pin FireWire (IEEE 1394) cable is used with an external PCMCIA IEEE 1394 interface card. For better mechanical safety of the connection, it is recommended to always use a PCMCIA IEEE 1394 interface card.

PC

Should the thermographic system VarioCAM® hr had be operated by a PC, an additional power supply for the infrared camera is not compulsory. However, it is recommended to always operate the thermographic system via a separate DC power supply unit. The 6-pin FireWire (IEEE 1394) cable (see Fig. 11, FireWire (IEEE 1394) cable, 6-pin, page 17) makes the hardware connection between the PCI-IEEE 1394 interface of the PC and the VarioCAM® hr.

Should the thermographic system VarioCAM® hr head be operated by a PC without any separate power supply, the manufacturer will not accept any liability for the appropriate operation of the thermographic system.

8.3 Installation of the FireWire Driver for the VarioCAM® hr head

For installing the device driver "vc_hires23", the access rights of the user group "Administrators" are definitely required. After successful installation, the programme IRBIS® online/process can be used with the access rights of the user group "Main users".

VarioCAM® hr head and the PC/notebook are connected with the help of the included FireWire (IEEE1394) cable. Then the PC/notebook and the thermographic system are to be powered on.

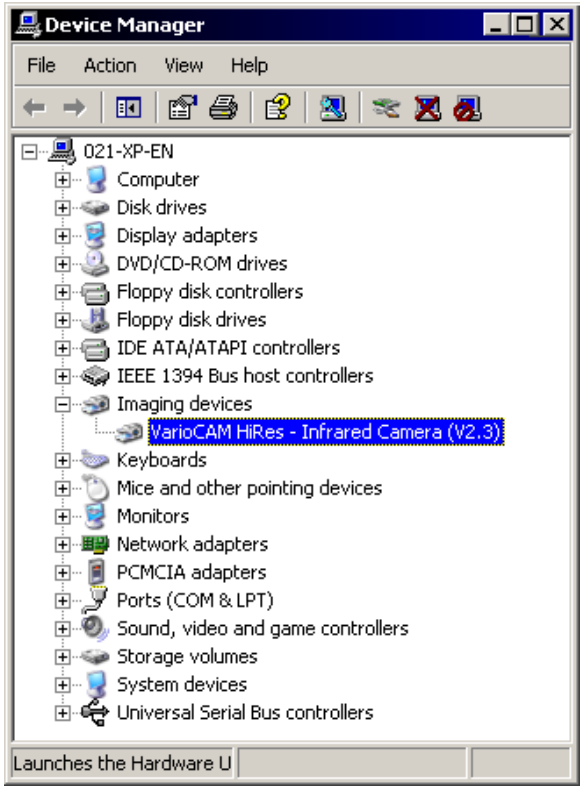


Fig. 28 Device manager – "Imaging device"

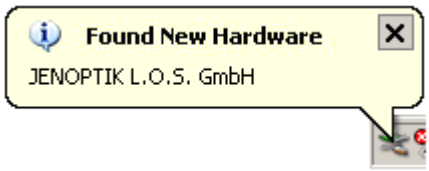


Fig. 29 Automatic hardware detection

Should you already have installed the infrared camera VarioCAM® hr head into your control PC by means of the file "VC2.inf", the camera will register within the device manager under "IEEE 1394 bus host controller". In this case, the current driver **"vc_hires23.inf"** must be allocated by function "Update

Driver...” (see Fig. 30). To call the pop-up menu “Update Driver…“, highlight the device driver first and confirm with a right mouse click.

The driver “vc_hires23” is a digitally signed device driver.

Please note that the use of device driver “vc_hires23” requires certain versions of the software family IRBIS®.

Updating the device driver always requires adjusting the file VC2.dll.

It is recommended to probably uninstall the existing control and acquisition software and replace it by current software versions.

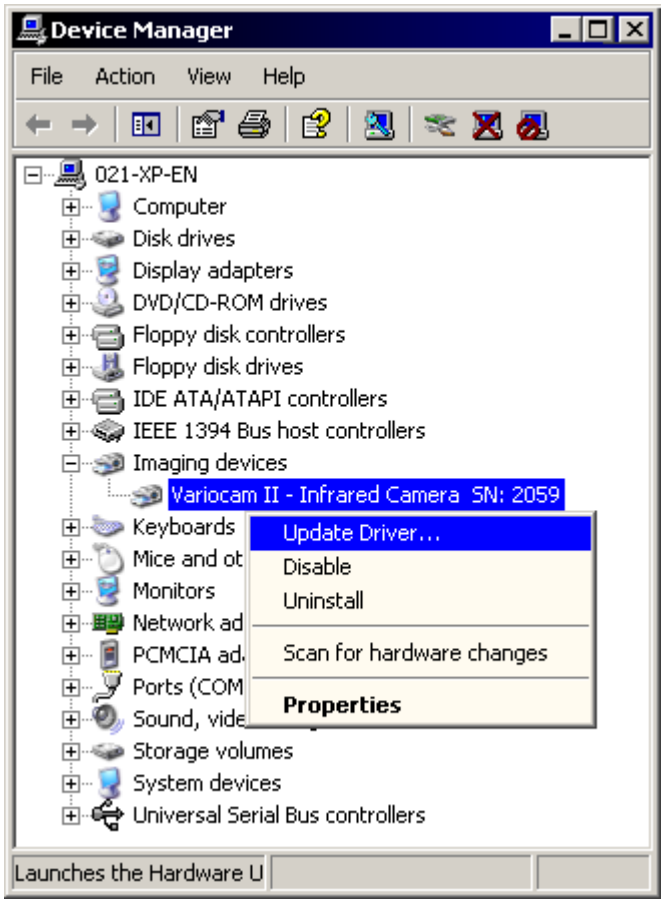


Fig. 30 Device manager – updating the driver “VC2.inf”

In this next part (**Welcome**) of the wizard select the option **"No, not this time"**. To continue the installation, click on **"Next >"**.

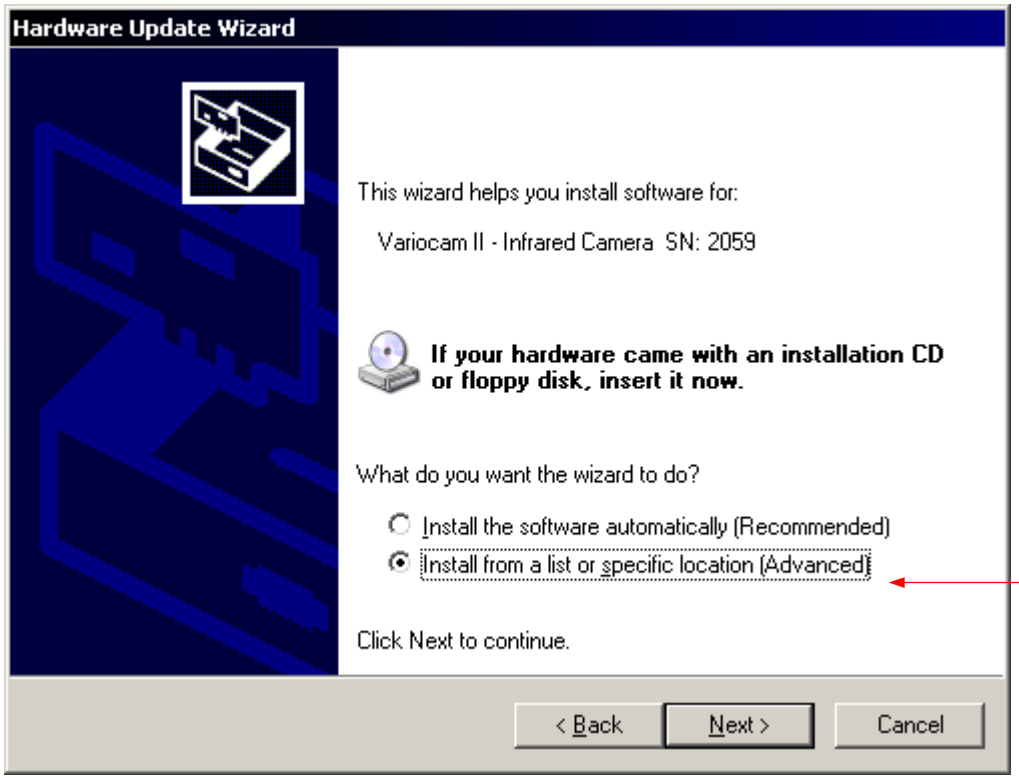


Fig. 31 Hardware wizard of Microsoft™ Windows™

In this part of the wizard, select the option **"Install from a list or specific location (Advanced)"**. Then click on **"Next >"** to continue the wizard.

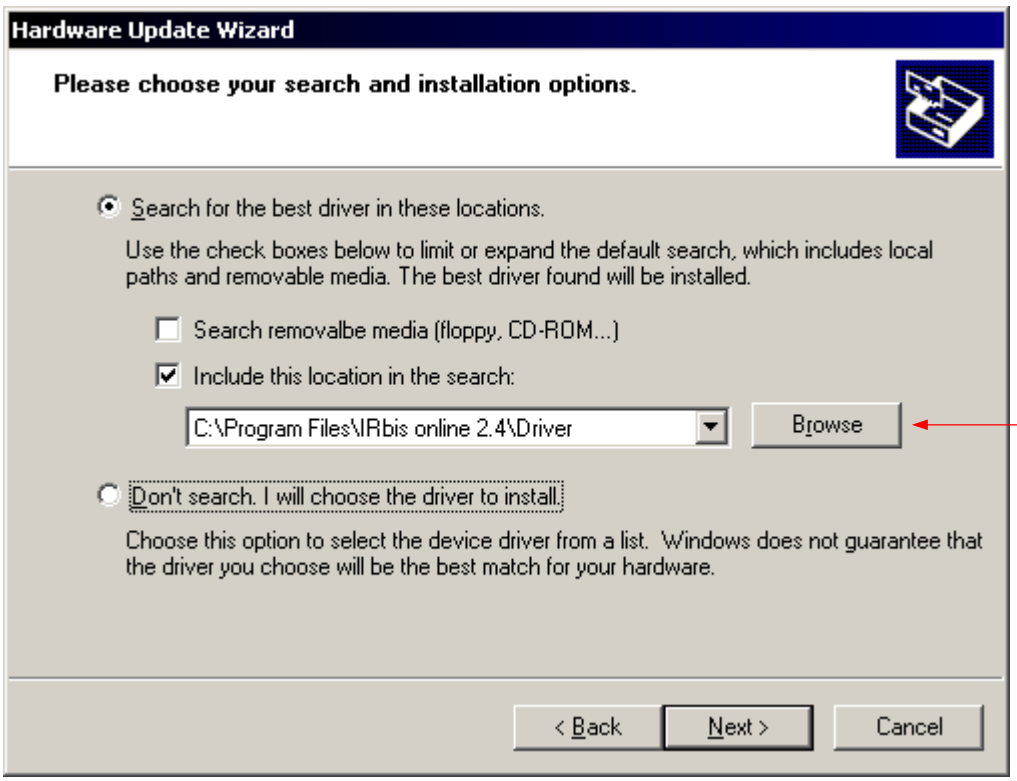


Fig. 32 Hardware wizard of Microsoft™ Windows™ – select driver

Select the option **"Search for the best driver in these locations"** and continue by clicking on **"Next >"**.

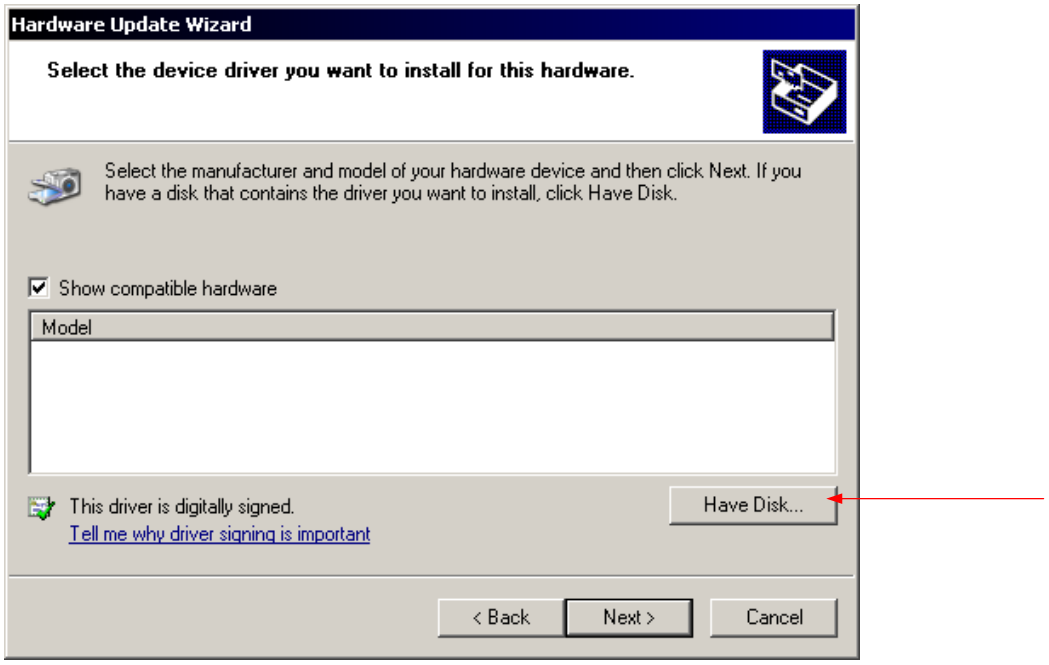


Fig. 33 Hardware wizard Windows™ - select device driver

In this part of the wizard, click on **"Have Disk..."**.
This will open the dialogue **"Install From Disk"**:

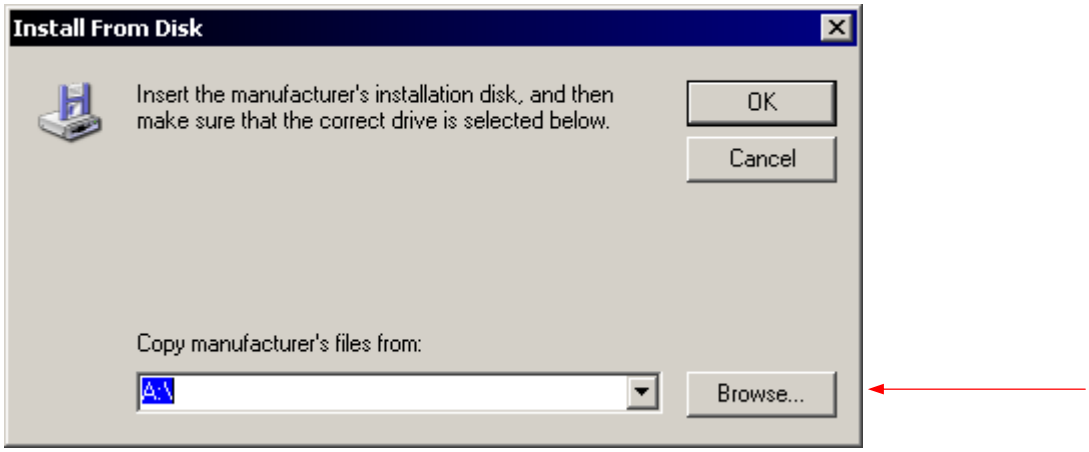


Fig. 34 Hardware wizard of Microsoft™ Windows™ – enter driver path

Clicking on **"Browse..."** will start the dialogue **"Locate File"**.

Choose the subdirectory “Driver” on the included installation CD or from the installation inventory of the IRBIS® remote software. There you will find the required device drivers for the thermographic system VarioCAM® hr head.

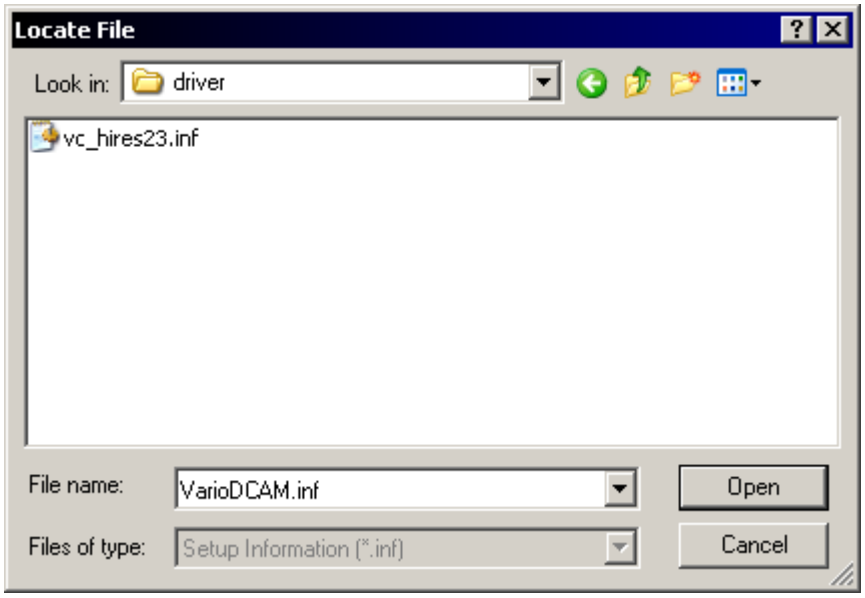


Fig. 35 Hardware wizard of Microsoft™ Windows™ - select driver file

Hightlight the file **"vc_hires23.inf"** and confirm the dialogue **"Locate File"** by clicking on **"Open"**.

Confirm the dialogue **"Install From Disk"** by hitting **"OK"**.

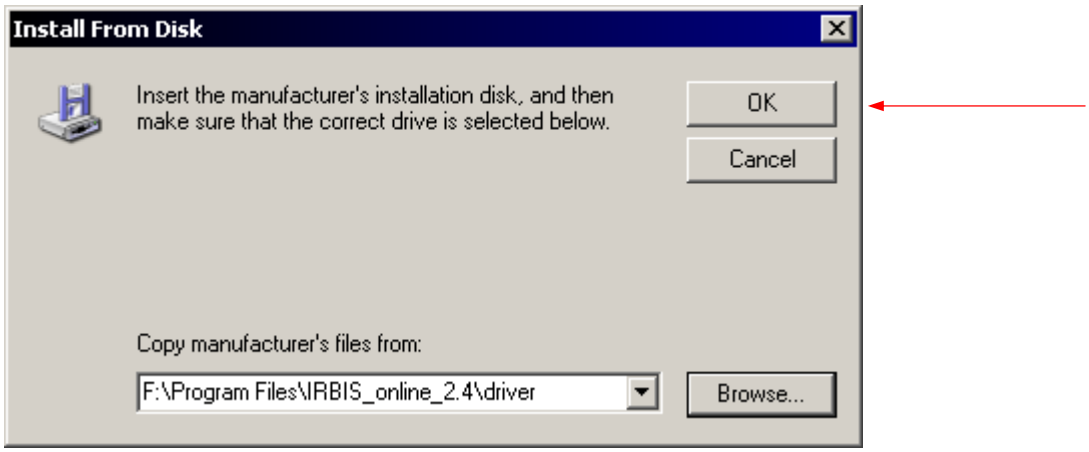


Fig. 36 Hardware wizard Windows™ - confirm driver path

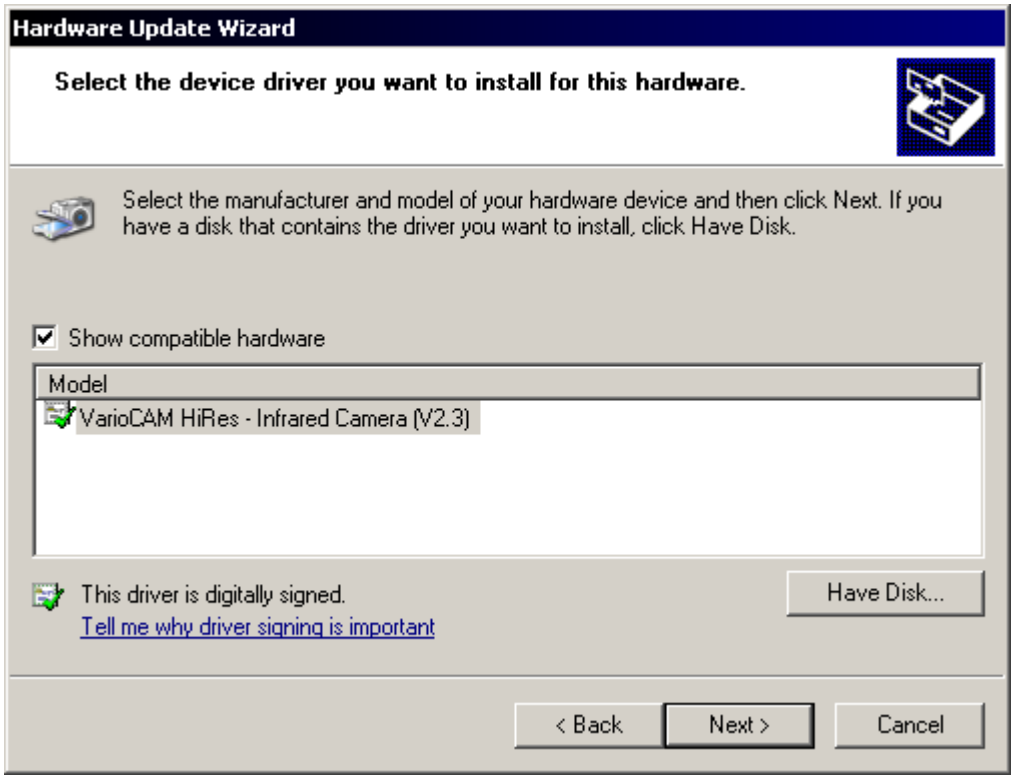


Fig. 37 Hardware wizard Windows™ - select hardware type

Click on **"Next >"** to start installing the driver for the thermographic system VarioCAM® hr.

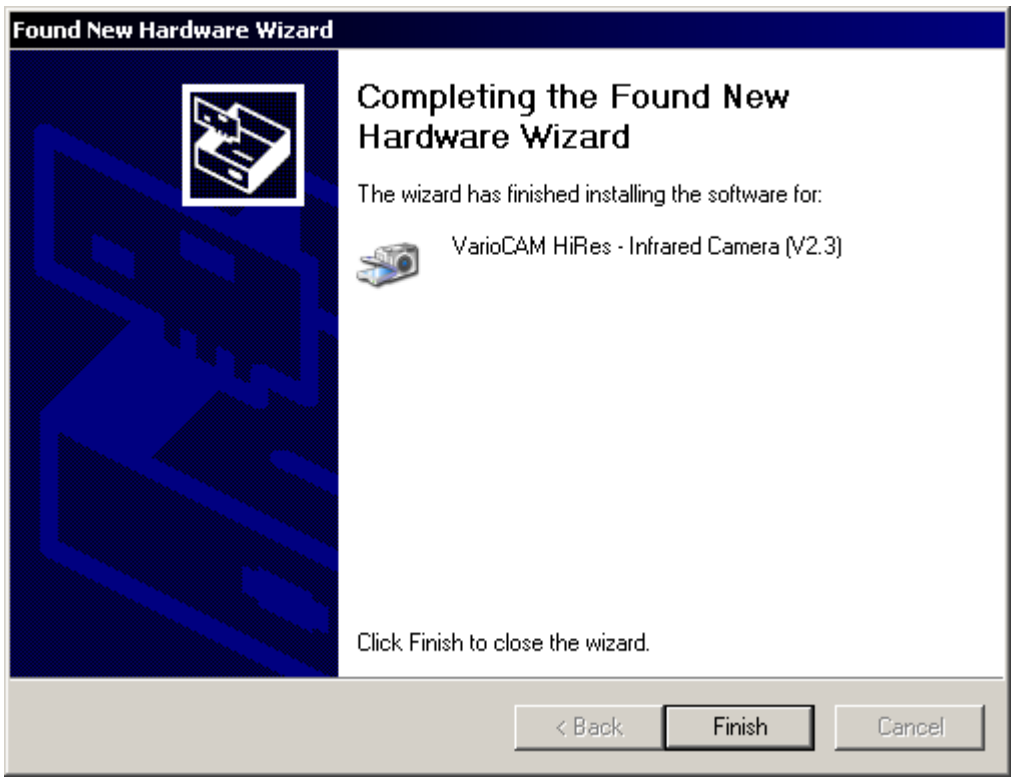


Fig. 38 Hardware wizard of Microsoft™ Windows™ – start installing the device driver

The hardware installation of the infrared camera VarioCAM® hr head has successfully been completed. To close the wizard, press **"Finish"**.

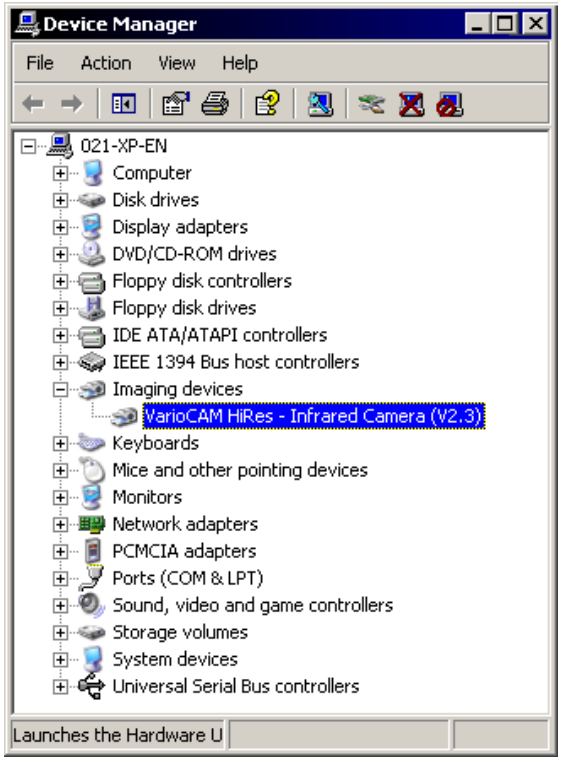


Fig. 39 Windows™ XP Professional Device Manager after successfully installing the VarioCAM® hr

After the successful installation of the “vc_hires23” driver, the VarioCAM® hr head will always be initialised in the Windows™ Device Manager as an image processing device.

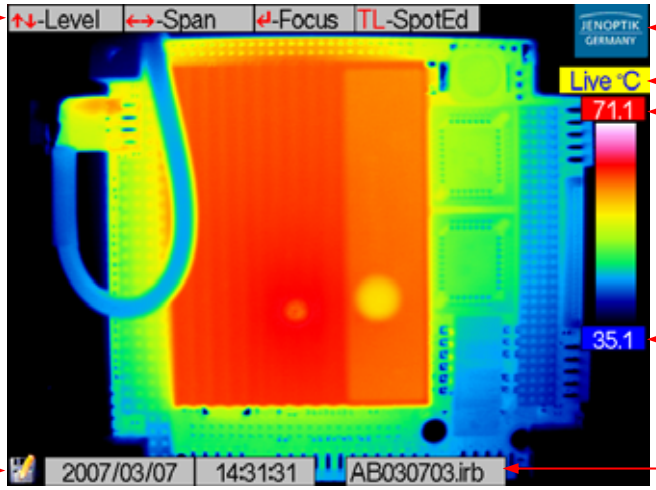
9 Operation

The menu structure of the VarioCAM® hr head is to be steered via the software **IRBIS® remote**. After the camera was connected with a PC/notebook and the software, the camera can be steered with the operating window (see chapter 10 Operating Software IRBIS® remote – page 64).

9.1 Elements of the Graphical User Interface

After switching it on and the system start, the thermographic system is in **live mode**. Apart from the current temperature, information is displayed via various image elements regarding the status of the system and regarding operation control.

Image elements



Help line

Logo

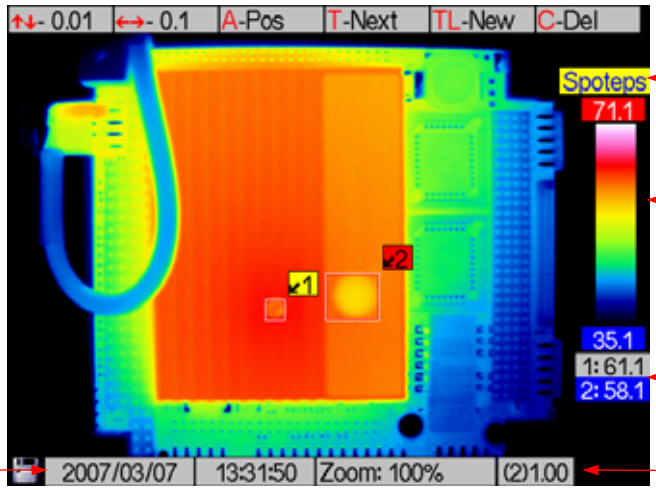
"Live" mode

Colour palette ("colour scale") with upper and lower limits of the displayed temperature range

Symbol for SD card in write access

File name of the thermogram stored

Fig. 40 Image elements, mode: live, thermogram is being saved



Status: spot editor: input emissivity

Colour palette ("colour scale")

Table of measured values

Date, time

Emissivity value for ROI 2

Fig. 41 Mode: spot editor, thermogram with 2 ROI

The selection of the displayed image elements can be changed in the menu item "Image elements" (see Chapter 9.6.1, Menu "Image", page 39).

The image elements have the following functions:

- Help — display of the active key assignment (basic functions)
- Logo — manufacturerer's logo JENOPTIK Laser, Optik, Systeme GmbH
- Status — active operating mode of thermal image system
- Scale — colour palette (colour scale) with the limits of the adjusted temperature range
- Table — display of temperatures of spots/ROI (**R**egion **O**f **I**nterest, measuring areas)
- Card symbol — status display of inserted SD card
- Info — changing info display:
  - No SD card — no memory card inserted
  - free:164 MB — free memory capacity of SD card in Megabyte
  - total:240 MB — total memory capacity of SD card in Megabyte
  - SD-Card: / — memory card inserted
  - 1:-40..120 — active calibration range in °C
  - Emis: 1.00 — active (global) emissivity
  - Zoom: 100% — active zoom in %
  - U: 11.05 V — voltage in Volt
  - U: 11.05 V — emissivity of active ROI
- Time — display of date and time

9.2 Live Mode

In the **live** mode, the temperature **level** of the scale that the thermal image is displayed in can be adjusted by the buttons ↑, ↓ and the temperature **range** can be adjusted by the buttons ←, →. Thereby the allocation of colours and grey values of the selected colour palette to the temperatures of the scene is changed. Each temperature of the scene is allocated a respective temperature value by colour/grey value (false-colour imaging). The digital storage of the thermograms is irrespective of the adjusted temperature scale so that temperatures outside the selected image range are included.

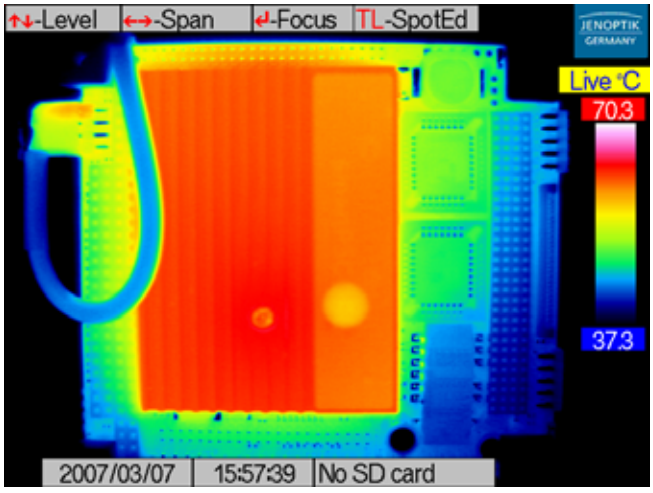


Fig. 42 Live mode

The **C** button is used to permanently change between the colour palettes in the live mode. The default setting when starting the system is the VarioCAM palette.

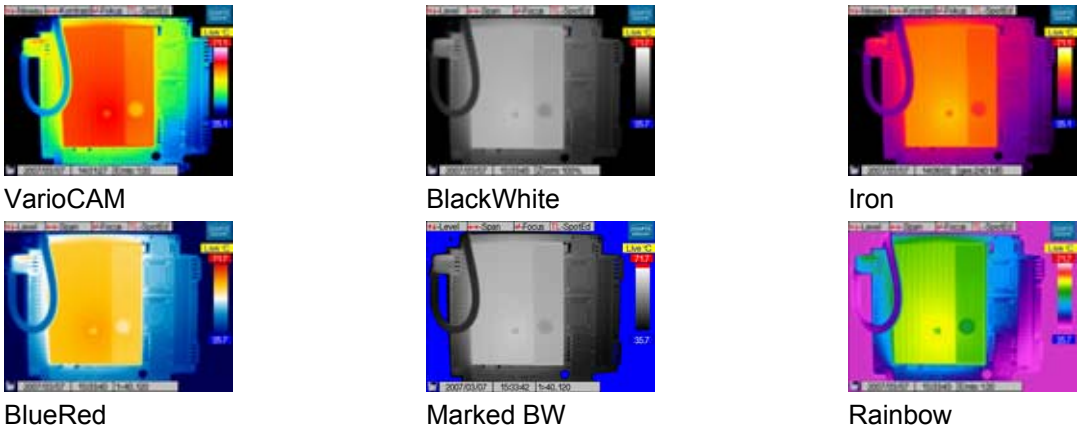


Fig. 43 Display of the various available colour palettes

In the live mode, the **A** button activates the Autoimage function and the image adjustment (NUC, **N**on **U**niformity **C**orrection, with internal shutter). While Autoimage is running, the temperature display is adjusted to the current scene so that all temperatures of the scene are included. The function of the **A** button can be configured in the main menu (see Chapter 9.6.4, Menu "Settings", page 53).

AL runs Autoimage, image calibration and additionally the Autofocus function.

The **T** button directly activates/deactivates Spots/ROI (see Chapter 9.4, Spot Editor*) as well as, depending on settings, the laser pointer (option) (also see Chapter 9.6.4, Menu "Settings", page 53).

Pressing the button **TL** starts the spot editor - see Chapter 9.4, Spot Editor*, page 34.

For switching off the camera, the stream supply has to be interrupted.

Pressing **Enter** changes from the live mode into the **focus** mode (see Chapter 9.3, Focus Mode, page 33).

9.3 Focus Mode

In the **focus mode**, larger or smaller object distances will be focused on by respectively moving the buttons ↑ and ↓. The progress bar marked **F** left of the colour palette shows the relative position of the focus - see Fig. 44.

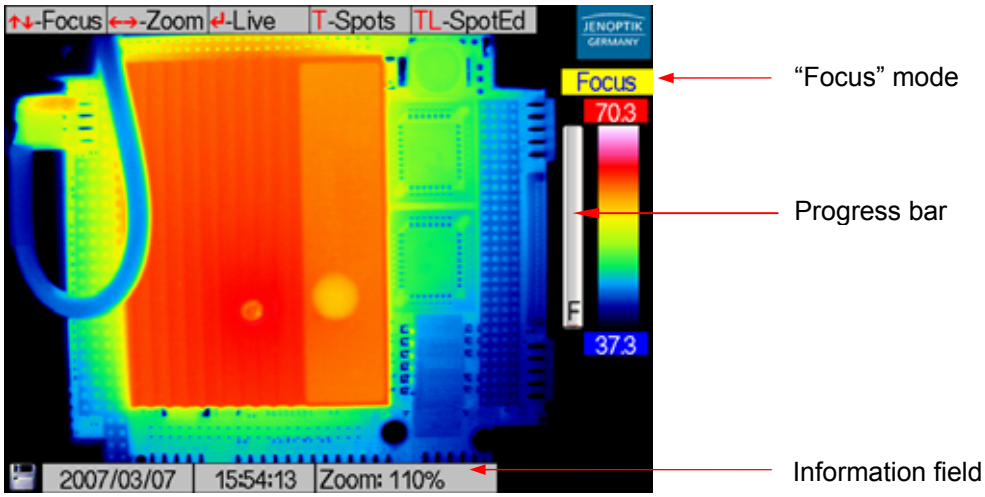


Fig. 44 Focus mode

Button actions → and ← digitally zoom the image in or out. Magnification levels in % are circulated in the information field. The loupe in the lower left image corner above the SD card symbol signals zoom adjustment > 100 %. Additionally, a progress bar **Z** is displayed left of the colour palette. The adjusted zoom level does not influence the digitally saved temperature data. They contain the complete image information (without any zoom).

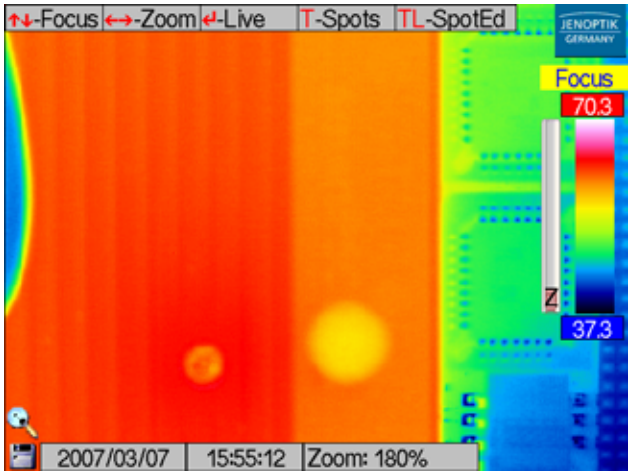


Fig. 45 Zoom

Button **TL** opens the spot editor – see Chapter 9.4, Spot Editor*, page 34.

The colour palette can be changed by means of the **C** button.

Enter returns the system to the **live mode** – see Chapter 9.4, Spot Editor*, page 34.

Apart from the main modes live and focus, more operating modes depending on the model version can be selected, which may directly be accessed via the operating keys or activated via the main menu.

9.4 Spot Editor*

The spot editor is started by pressing the **T** button for a longer period (**TL**).

It comprises three states:

- **Spotpos**
- **Spotdim**
- **Spoteps**

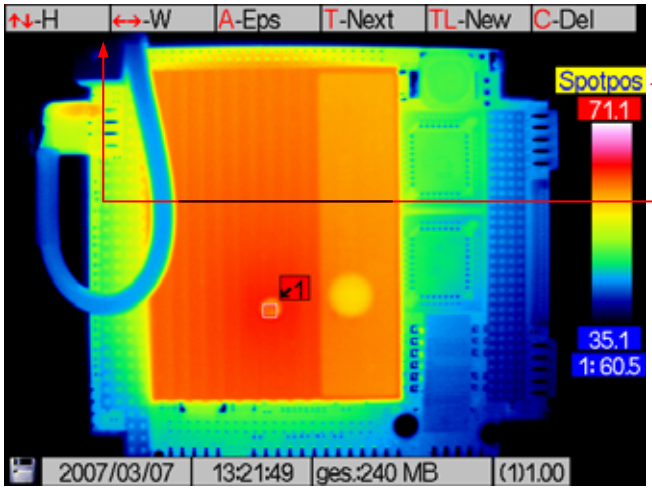
These states serve to define and process measurement spots or measurement areas (generally **ROI**, **R**egion **O**f **I**nterest).

An ROI of the resolution of (2 x 2) pixels is defined as a measurement spot. Measurement spots are used for “punctiform” temperature measurement whereas the result is stated as an average of the image pixels. If the spot is enlarged to become a measurement area, the display of the local minimum and maximum temperatures in addition to the average is possible. The display of Minimum/Maximum can be activated via the 9.6.3 Menu "Measure", page 49.

The temperature for an ROI can be displayed via the measurement value table displayed in the lower right corner or directly in the ROI. The respective adjustment must be made in the main menu (9.6.1 Menu "Image", Fig. 65, page 42).

Status "Spotpos"

Pressing **TL** in the live or focus mode at first starts the mode **“Spotpos”**, in which the **position** of the ROI can be altered. Upon the first initialisation of the spot editor, a spot is automatically generated in the centre of the thermal image.



Spot editor: “Spotpos”

Help for buttons movements for changing position in **Y** or **X** direction

Fig. 46 View of the spot editor with an ROI

The position of the ROI is changed by using the buttons, whereas movements ↑ and ↓ move the ROI vertically up and down, and ← and → horizontally left and right (see Fig. 37).
If one ROI is active in the spot editor, the next (second) spot can be activated by using the **T** button. The respectively active ROI (to be moved in Spotpos) is marked with an identifier coloured red. Inactive ROIs are labeled yellow. If the measuring table is displayed, the active ROI will be labeled blue and measured data of all inactive ROIs will be grey (see Fig. 48).

If several ROIs are displayed, **briefly** pressing the **T** button changes the selection; a **long** press on the **T** button (**TL**) creates a new spot. The maximum number of possible ROIs depends on the equipment.

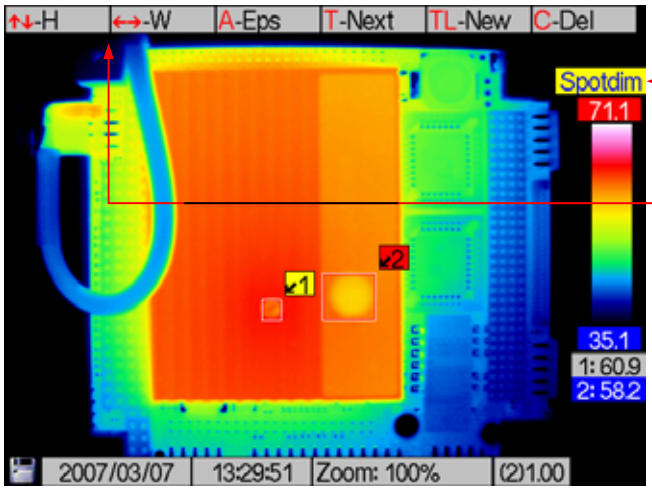
Fig. 47 Message when the maximum number of measuring fields has been reached

The respectively active ROI is deleted by pressing **C**. Deleting the last ROI exits the spot editor and returns to the live mode.

Pressing the **A** button switches from the **"Spotpos"** to the **"Spotdim"** mode.

Status "Spotdim"

In the **"Spotdim"** status the size of the ROI can be changed.



Spot editor: “Spotdim”

Help for button movements for changes to height (**H**) or width (**W**) of the ROI

Fig. 48 View of the spot editor in the "Spotdim" status

Action ↑ will increase the height; ↓ will decrease the height of the ROI. Button → will widen the ROI, ← will narrow its width.

The valid image area for ROIs (also for the display of T_{Max}/T_{Min}) is limited to the central image area that is not used by system displays. This ensures that displayed system information will not obscure any measuring spots. With the assistance of the thermographic evaluation software, measuring and editing in the whole image area in the digitally saved thermograms is possible without any restrictions.

Pressing the **A** button switches from the **"Spotdim"** to the **"Spoteps"** mode.

Status "Spoteps"

In the **"Spoteps"** status, the emissivity of a measuring area can be changed from 0.01 to 1.00.

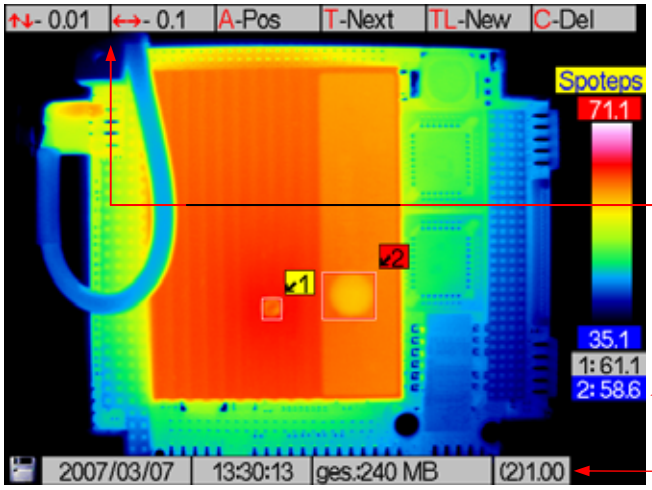


Fig. 49 View of the spot editor in the "Spotdim" status

The emissivity of the respectively active ROI can be changed using the buttons. When pressed briefly, buttons ←, → respectively reduce or increase emissivity by 0.1; buttons ↑, ↓ respectively reduce or increase emissivity by 0.01. When pressing the buttons for a longer time, emmissivity may be adjusted faster by larger increments.

When generating an ROI, the globally valid emissivity is, first of all, adopted for this ROI (sea 9.6.3 Menu "Measure", page 49). The emissivity is to be changed in Spoteps for each ROI individually. Differences between local emissivity and the globally set value are shown by changes in the font colour of the identifier of the respective ROI: It will then be purple (instead of black if global = local emissivity).

Emissivity settings will affect the temperature calculation within a measuring area.

9.5 Stop Mode and Data Storage

The **S** button switches directly from the **live** and **focus** modes to the **stop** mode.
The **stop** mode freezes further image input, the image content (except date, time and info box) will not be updated further. Using **C** or **Enter** changes from the **stop** mode into the **live** mode.

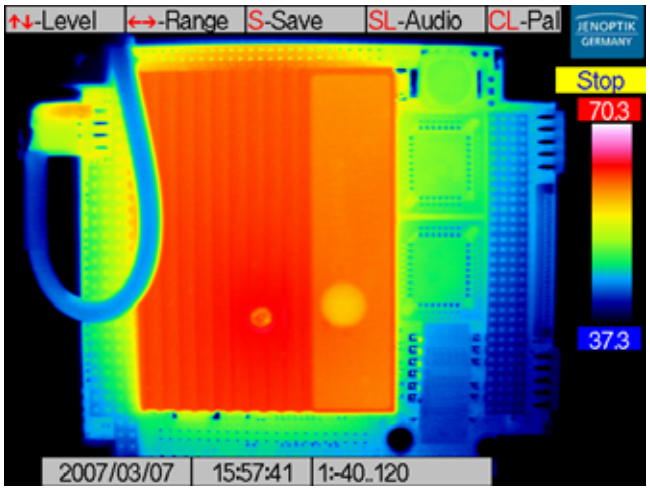


Fig. 50 Stop mode

As in the **live** mode, the temperature **level** of the displayed scale of the thermal image can be set by the buttons ↑, ↓ and the temperature **range** by ←, → in the **stop** mode.

By pressing the **C** button for a longer time (**CL**), the selection of colour palettes will circulate and can be chosen from.

In order to save thermal images with the VarioCAM® hr, an SD card must have been inserted into the card slot. Otherwise an error message will be displayed if any saving is attempted (see Fig. 51).

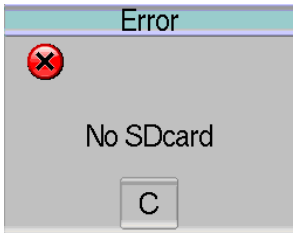


Fig. 51 Message if SD card is missing

Fig. 52 Message if SD card in the slot is write-protected

Fig. 53 Symbol for write-protected SD card

Upon starting the system or with each card change, the status of the SD card will be displayed for a few seconds:

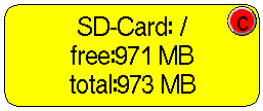


Fig. 54 Status SD card

A possibly write-protected SD card will subsequently be displayed as shown in Fig. 53. In the **stop** mode, the current thermogram is saved by using the **S** button. Storing it directly out of **live** (or **focus**) is possible by pressing the **S** button (**SL**) for a longer period (quick save). The saving process is displayed in the lower left image corner (pen on SD card symbol). Simultaneously the name of the saved file is displayed in the info box (see Fig. 55).

After the saving process, the mode automatically changes from **stop** into **live**.

Depending on the equipment, VarioCAM® hr head can save further data (screenshots, ROI positions) in addition to the thermogram, to be selected from the menu (see Chapter 9.6.2, Menu "File", page 44).

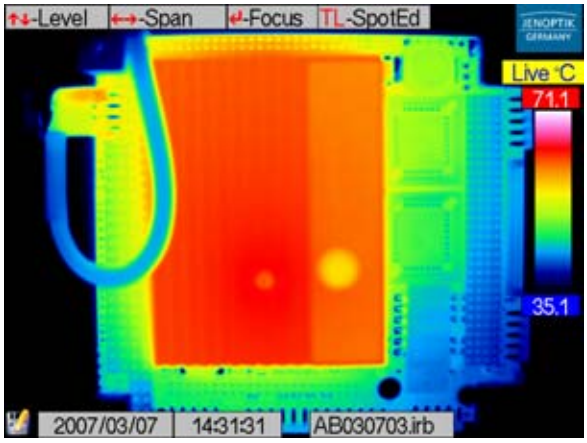


Fig. 55 Data storage

9.6 The Main Menu

In the live or focus mode, a **long** press (middle key) on the button (**EnterL**) will open the main menu.

Via the main menu, further functions can be called up and other system settings can be made or recalled.

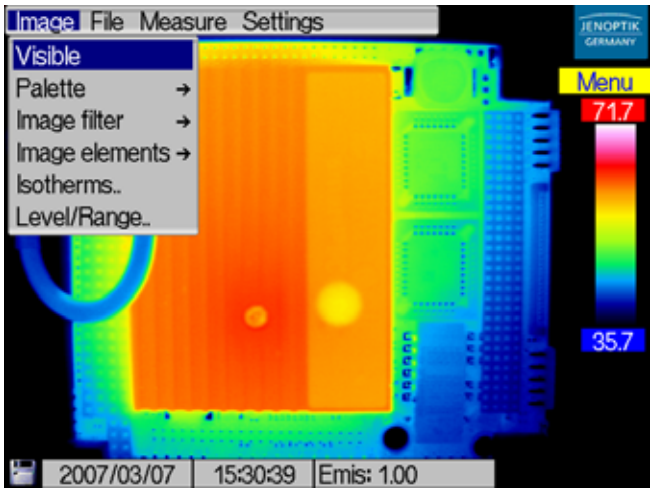


Fig. 56 Main menu

The menu is navigated by the buttons ←, → and ↑, ↓. Menu items on the next level, which are marked **".."**, can be opened by **Enter**.

Upon first calling up the menu, the pointer will be in the main menu on the left on menu item “Image”. The menu will already have rolled down (see Fig. 56). The current position (with the first call always on the uppermost menu item) is highlighted blue. Calling up the menu later again will always show the item changed most recently (highlighted blue), so that previous changes can quickly be modified again.

The menu can be exited unchanged by using the **C** button.

9.6.1 Menu "Image"

Fig. 57 shows the menu **"Image"**. This menu includes all the functions relevant for displaying the thermal image.

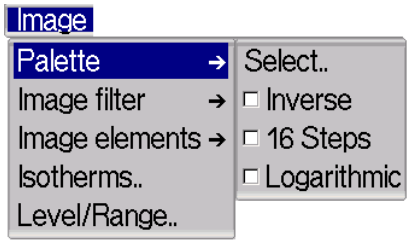


Fig. 57 Menu "Image"

Menu item "Palette"

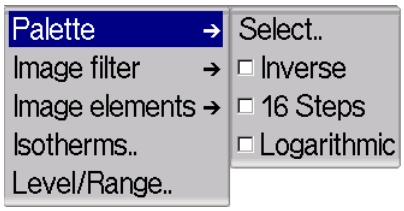


Fig. 58 Menu item "Image" - "Palette"

In menu item Palette , the palette settings for displaying the temperature distribution in the thermal image are made. The current allocation of the various colours/grey scales of the false-colour display to the respective temperatures is set by means of the palette shown on the right of the display (“Colour scale”, see Fig. 40, page 30). Thereby, the maximum value of the imaged area above and its minimum below the colour scale serve as an orientation towards the temperature level.

Menu item Palette → **Select..** (see Fig. 60) opens a dialogue for selecting the predefined palettes, with the following selection to be chosen from:

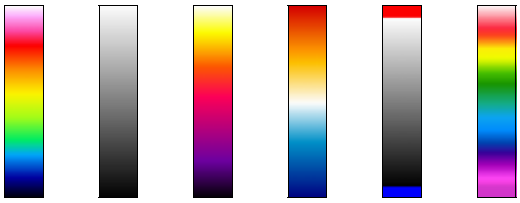


Fig. 59 Colour palettes: VarioCAM, BlackWhite, IronBow, BlueRed, Marked BW, Rainbow

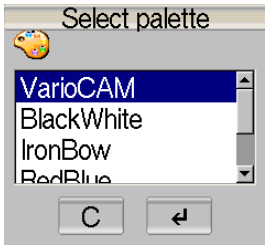


Fig. 60 Dialogue "Select palette"

The palettes can also be circulated simply in the **live** and **focus** modes without calling up the menu function by briefly hitting the **C** button, at **stop** by (long) **CL**.

Menu item Palette → **Inverse** inverts the current palette. If, for example, the BlackWhite palette is selected, the lower temperatures are displayed in black by default and the higher temperatures in white. If the **"Inverse"** function is activated for BlackWhite, the display will be inverted: Now the lower temperatures are visualised in white and the higher ones in black (see Fig. 61).

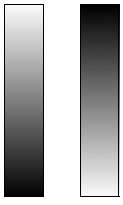


Fig. 61 BlackWhite colour scale (left) and its inverted display (right)

Menu item Palette →**16 Steps** toggles the display between the default colour depth of 256 colours and 16 steps. By activating the **"16 Steps"** function, only 16 temperature levels will be displayed instead of 256. Thereby, distinctions in the image beyond the 16 levels will not be visible any more, “summarising” the scene in 16 “classes” of the same temperature level (see Fig. 62).

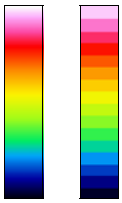


Fig. 62 Colour scale 256 colours (left) and 16 colours (right)

The menu item Palette →**Logarithmic** toggles the display of temperature values between linear and logarithmic progression. By default, the linear display of temperatures has been selected. Activating this function facilitates to use a more differentiated resolution for the lower temperature range than for the higher one. The effects of the logarithmic presentation can be seen in Fig. 63. The linear colour scale is displayed on the left. The one in the middle shows its logarithmic version. For better visualisation of the logarithmic grading, the right one shows the same version defined by only 16 colours, clearly showing the higher colour resolution for the lower temperatures.

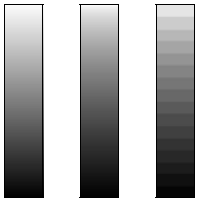


Fig. 63 Linear BlackWhite colour scale (left) and its logarithmic presentation (middle) and its logarithmic presentation in 16 colours (right)

Logarithimic presentation is recommended for scenes of high temperature dynamics where, independently of large differences between temperature maximum and minimum, a differentiated presentation in the lower temperature range is of importance, for example, a printed circuit board with a “hot” component where, apart from T_{Max}, temperature differences in the lower display range are also of interest.
Activation of the functions **"Inverse", "16 Steps"** or **"Logarithmic"** is marked by a prefixed checkmark in front of the respective menu item. The combination of all three options with each other is possible.

Menu item "Image filter"

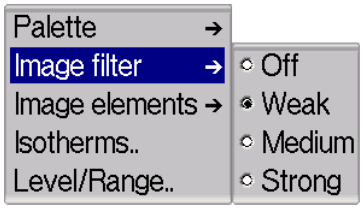


Fig. 64 Menu item "Image" - "Image filter"

Using the menu item "Image filter", a filter for the presentation of thermal images can be adjusted. As a filter, a digital low-pass filter of the first order is used.

Via the submenu, choice can be made from among four filter levels **"Off", "Weak", "Medium"** and **"Strong"**. Filtering reduces image noise, which in particular visibly improves the image quality of scenes of a low temperature gradient. The filter setting “Off” or “Weak” should be used for moving objects or the documentation of fast temperature changes.

Menu item "Image elements"

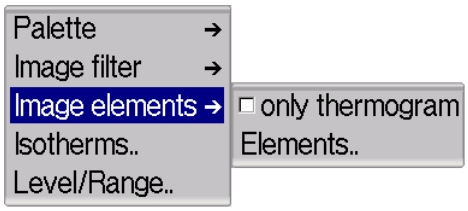


Fig. 65 Menu “Image” – “Image elements”

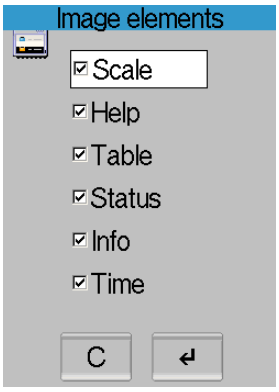


Fig. 66 Dialogue “Image elements”

By selecting image elements from the menu item “Image elements”, the graphical user interface can be personalised. The menu contains two suboptions **"only thermogram"** and **"Elements.."**. By selecting **"only thermogram"**, all image elements (except the JENOPTIK logo) of the graphical user interface are hidden at once. If this function is active, a checkmark will be displayed left of the menu item "only thermogram".

Via **"Elements.."**, the submenu "Image elements" (see Fig. 66) for selecting individual image elements will open. Selection is made by moving the buttons ←,→ ; to navigate in the table use ↑, ↓.

Should you desire to preserve a selection of image elements once made (as well as of the colour palette or of image filter settings ...) beyond the re-boot of the thermographic system s, this can be done via saving the configuration (Menu → Settings → Configuration, see Fig. 132, Dialogue "Save configuration", page 62).

Menu item "Isotherms.."/Isotherm editor*

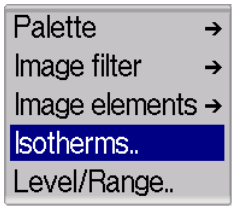


Fig. 67 Menu “Image” – “Isotherms..”

The isotherm editor is started via menu item Image →**Isotherms..** (Fig. 67). Isotherms colour-mark ranges of the same temperature. With the help of the isotherm editor it is possible, to design isotherms of different (temperature) “width” and “height”. The temperature ranges can be labeled in different colours. For clearly allocating the isotherms it is recommended to use coloured isotherms in conjunction with the BlackWhite palette or with black, white or grey isotherms for colour palettes.

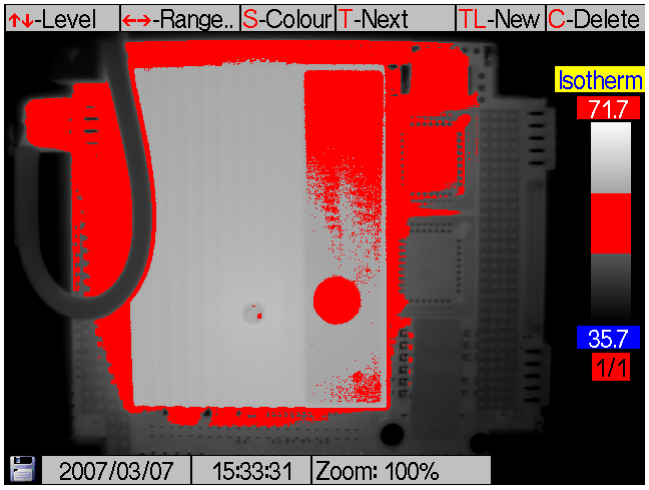


Fig. 68 Thermal image in the BlackWhite colour scale and with the isotherm displayed

The help bar shows the most important buttons in this mode (see Fig. 69).

Fig. 69 Help for the isotherm editor

Button movements ↑, ↓ change the level of the respectively active isotherm and ←, → increases or decreases the range. The respectively active isotherm is displayed below the colour palette.

The **S** button progressively changes the colour of the isotherm, whereas using **S** will change to the respectively next colour acc. to the sequence shown in Fig. 70.

Fig. 70 Colour palette for isotherms

If an isotherm already exists, a second one is created by pressing **TL**. Should more than one isotherm exist, **T** will switch to selecting the active isotherm. By using **TL**, another isotherm can be generated. The possible number of isotherms depends on the model.
A opens an input dialogue in the isotherm editor, which will facilitate a numerical definition of limits of the currently displayed isotherm.

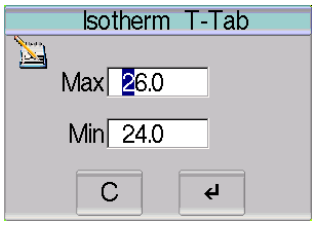


Fig. 71 Input window for the numerical definition of isotherms

A defined isotherm always relates to a fixed temperature level and to a fixed temperature range. If, in the live mode, the temperature scale is changed, the position of the isotherm in the palette will be adjusted accordingly; however, the temperature limits will remain unchanged.

Menu item "Level/Range.."

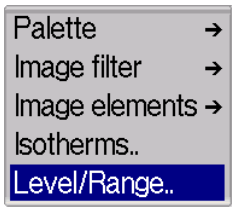


Fig. 72 Menu "Image" - "Level/Range.."

The menu item **"Level/Range.."** starts a dialogue for numerically defining values for the temperature level and the temperature range (see Fig. 73). The temperature level thereby defines the centre and the temperature range defines the width of the set imaging area. However, the thermal image is saved independently of the limits of the imaged area.
Example: At a desired temperature range of 20°C to 30°C, the level needs to be set at 25°C and 10 K for the range.

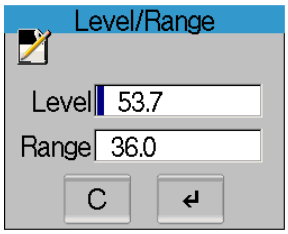


Fig. 73 Dialogue "Level/Range"

Buttons movements ↑, ↓ change the numerical value (figure in the input box marked blue), ←, → change the position. The **T** button serves to toggle between input boxes.

9.6.2 Menu "File"

Fig. 74 Menu "File"

Fig. 74 shows the options of the **"File"** menu. It comprises all functions relating to the file system. The various items are described in the following sections.

Directory structure of the VarioCAM® hr head

With each data storage, the VarioCAM® hr head at first automatically generates subdirectories on the SD card, whose names enable the user to re-access desired files quickly, also with large amounts of data. Files are always saved in a subdirectory. The name of the subdirectory is generated by means of the current date, e.g., on 22 June 2007 the directory would be generated by the name of 070622aa. The maximum number of files to be saved in a directory is limited to 100 in order to avoid the strenuous search in long lists. Within a directory, the files are consecutively numbered, but, due to their trunk name

(2 letters + month + day, e.g., AA0622xx,) they can always be related to the respective directory. Should a subdirectory be full (e.g., with file AA0622**99**.irb), the next file would be generated in directory 070622**ab** by the file name AB062200. Thus, filenames are consecutively numbered, beginning at 00 through 99 and, contrary to the directory, do not have any indication for the year in their names. Therefore, on one day and fully exhausting the capacity of automatically generating directories and filenames, a maximum of 26 x 26 x 100 = 67,600 files can be saved in 676 directories.

Please note that with each and every new start of the thermographic system s as well as with each serial measurement*, regardless of the contents of previously generated directories, a new subdirectory will be created. Should additional files (VIS, Audio, Screenshot, Data) be saved as extra files, the number of possible thermal image files in one directory will reduce accordingly*.

Menu item "Load file.."

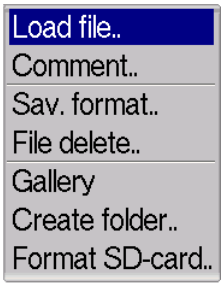


Fig. 75 Menu “File” – “Load file..”

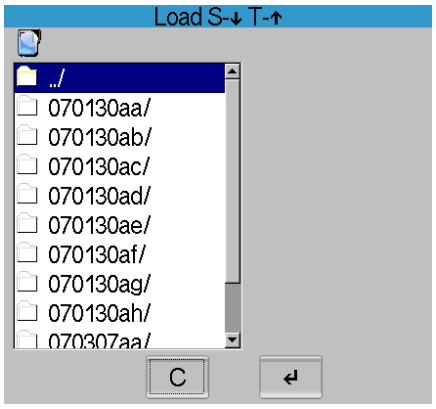


Fig. 76 Dialogue "Load" – directory structure

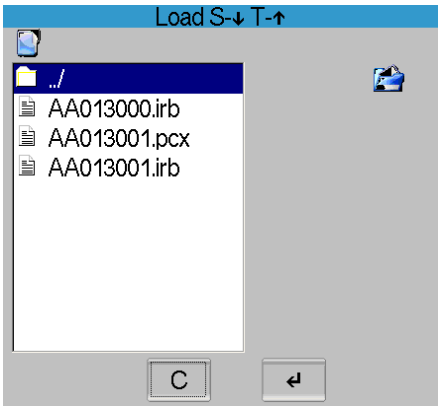


Fig. 77 Dialogue "Load" - files

After selecting **"Load file.."**, the current directory structure with its contents is displayed in a dialogue (see Fig. 76). The respective directory and the file to be loaded are selected by using the buttons and by subsequently confirming this with **E**nter.

Next to the list of files available in the directory, the preview of selected IRB files is displayed on the right.

A preview is not displayed for graphical files* (BMP, PNG, PCX).

The previously saved, reloaded image is displayed in the same temperature scale as previously saved, regardless of the scale set at the time of the reload. In the status field, “Image” marks the reloaded image (see Fig. 78, Reloaded image status “Image”). Moving the buttons ↑, ↓ changes the temperature level

and ←, → changes the scope of the image. Using **CL** changes the palette for the reloaded image. **C** serves to return to the live mode, whereas the previously set temperature scale will be restored.

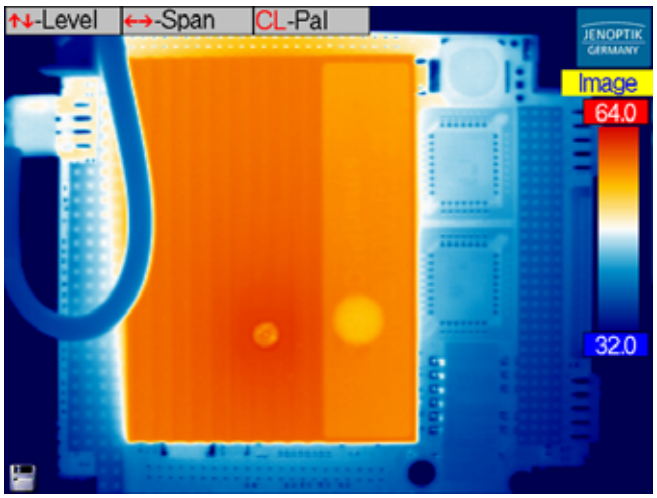


Fig. 78 Reloaded image status "Image"

Menu item "Comment.."

Fig. 79 Menu "File" – "Comment.."

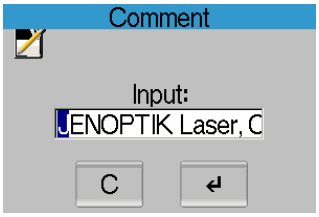


Fig. 80 Dialogue "Comment"

By selecting this menu item, a dialogue for entering a comment will be opened (see Fig. 80), which is saved with each thermal image. Moving the buttons ↑, ↓ chooses the desired sign, ←, → chooses the position. **S** deletes the current character. The comment (e.g., name of the firm or client) can be displayed and printed out when evaluating saved thermograms with the help of the evaluation software IRBIS®.

Please note that the permanent storage of the set comment requires saving the configuration (Menu → Settings → Configuration, see Fig. 132, Dialogue "Save configuration", page 62).

Menu item "Sav. format.."

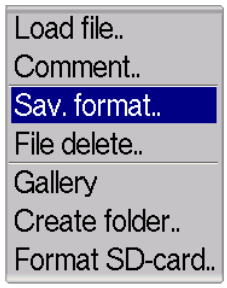


Fig. 81 Menu "File" – "Sav. format.."

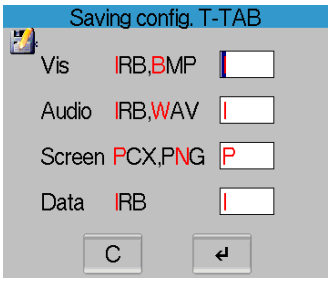


Fig. 82 Dialogue "Saving config."

Via the menu item **"Sav. format.."**, files to be saved additionally to the thermal image and their format can be selected. For this purpose, a dialogue with four options is displayed (see Fig. *82*).

The following table shows which option has which effect:

Saving format	Selection 1	Selection 2
Screen	**P** = saving the entire current screen as a PCX file	**N** = saving the entire current screen as a PNG file
Data*	**I** = saving measuring definitions in IRB	-

The **T** button (tabulator) serves to toggle between the various options. Selection is made by moving the buttons ↑, ↓. Regardless of the selection made, the data of the thermal image will be saved compressed and free of loss. When selecting “I”, the additionally selected files (VIS or Audio) are contained in the IRB file. For “B”, “W”, “P” and “N”, additional files whose contents will also be readable by other (standard) software are generated.

Example: Selection Screen P activates the saving of the screenshot as a PCX file.

Menu item "File delete.."

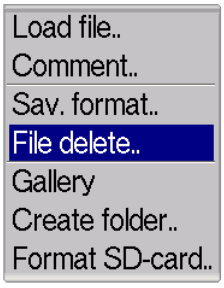


Fig. 83 Menu “File” – “File delete..”

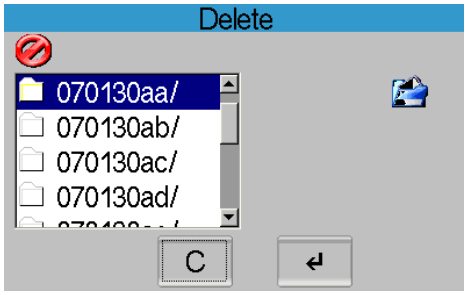


Fig. 84 Dialogue “Delete” – directory structure

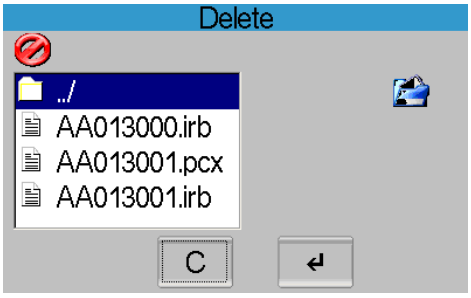


Fig. 85 Dialogue “Delete” - Files

After selecting the item **“File delete..”**, the directory structure is shown in a dialogue (see Fig. 84), where the IRB files have been saved. The respective directory and the file to be deleted are selected by moving the buttons ↑, ↓; **S** takes you to the end, **T** to the beginning of the displayed list. The selected file is immediately und irrevocably deleted by pressing **Enter**.

This process cannot be reversed!

Complete directories cannot be deleted.

Menu item "Gallery"

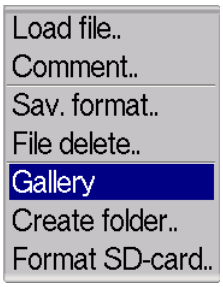


Fig. 86 Menu "File" – "Gallery"

Via the menu item **"Gallery"**, the IRB files saved on the SD card are displayed as previews. By using the buttons ↑, ↓ and ←, →, an IRB file can be selected (white-red frame) and subsequently loaded by using **Enter** (→Image). By means of the **S** button, the last file is selected from the directory, the **T** button takes you to the beginning of the list. **CL** changes the palette. Name and number of the currently selected file as well as the current directory name are displayed in the top margin of the gallery from left to right.

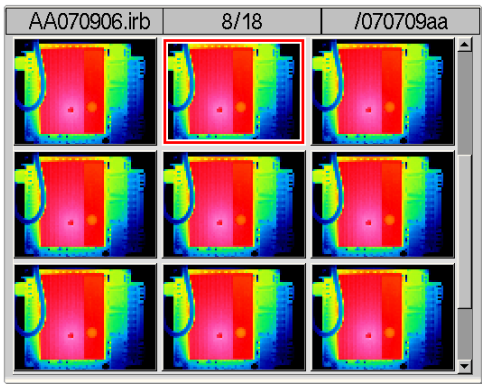


Fig. 87 Menu "File" – "Gallery display"

Menu item "Create folder.."

Fig. 88 Menu "File" – "Create folder.."

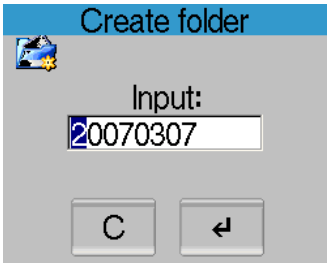


Fig. 89 Dialogue "Create folder"

This function permits to create directories on the SD card and allocate names to them of maximum 8 characters. The current date in the form of JJJJMMTT is suggested. Using the buttons ↑, ↓ can change the desired character; ←, → change the position. **S** deletes the current character. Directories can only be created in the root path; therefore, there is only one directory level. After creating the directory it will subsequently be used for saving the IRB files.

The file names will then consecutively be numbered from 00 to 99, whereas the first six characters in the filename conform to the first six characters of the directory.

Example: In a newly created directory named “INFRATEC”, the IRB files are saved under the following names: INFRAT00.irb, INFRAT01.irb, etc.

Menu item “Format SD-card”.."

Fig. 90 Menu “File” – “Format SD-card..”

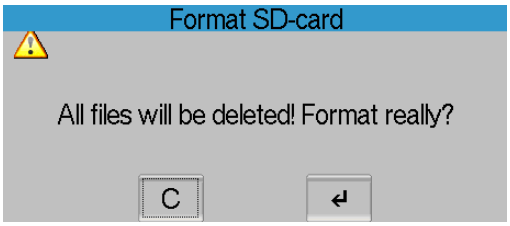


Fig. 91 Dialogue “Format SD-card”

After selecting **“Format SD-card”**, a dialogue will appear that needs to be confirmed by **Enter** in order to delete all files on the card and to reformat it. After formatting, all files have irrevocably been deleted.

This process cannot be reversed!

9.6.3 Menu "Measure"

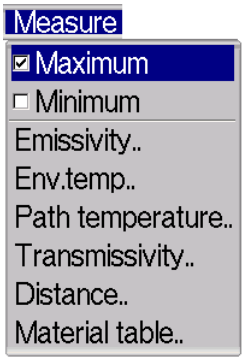


Fig. 92 Menu “Measure”

The menu **“Measure”** contains all the functions regarding temperature measurement. The menu structure is shown in Fig. 92. The individual options are described in more detail in the following.

Menu items “Maximum” and “Minimum”

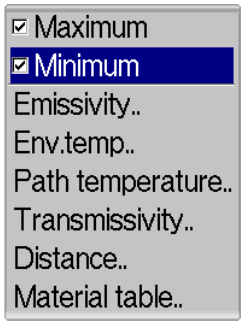


Fig. 93 Menu “Measure” – “Maximum” and “Minimum”

Selecting “Maximum” and “Minimum” offers the possibility to display the (global) temperature maximum or temperature minimum, respectively, within the thermal image. Position and value are permanently updated in the image. Regardless of the palette selected for false-colour imaging, the maximum will be displayed red and the minimum blue.

The maximum and minimum is displayed only inside the central image area where no other system displays are shown. These displays are not contained in the digitally saved thermal images, but they may be saved as a screenshot when saving the display. The evaluation software IRBIS® enables the display of maximum and minimum of the entire image area if the saved thermal images are subsequently processed.

With activated measurement areas / ROI (see Chapter 9.4 Spot Editor*, p. 34), temperature maximum and temperature minimum are displayed in the ROIs (see Fig. 94).

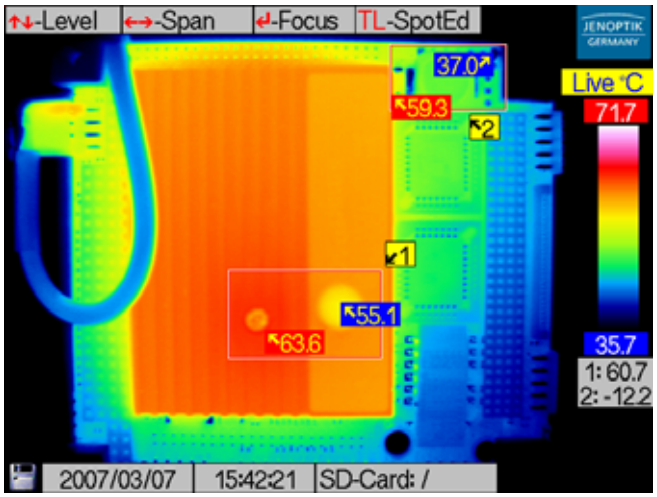


Fig. 94 Thermal image with ROIs and temperature maximum/minimum

Menu items
"Emissivity..", "Env.temp..", "Path temperature..", "Transmissivity..", "Distance.."

Parameters Emissivity and Environmental temperature as well as Path temperature, Transmissivity and Distance provide for precise temperature measurement, taking into account real measuring conditions, especially:

- the surface properties of the object to be measured and the ambient temperature level
- the transmissivity of the optical channel, the path temperature and distance.

Correct input of the respective correction parameters requires exact knowledge of the real properties of the object to be measured as well as of ambient conditions and of the measurement setup. The correction parameters are adopted for the entire image.

The five menu items **"Emissivity..", "Env.temp..", "Path temperature..", "Transmissivity.."** and **"Distance.."** can be used to set the respective parameters for the current scene. When selecting a menu item, an appropriate dialogue will open to allow to enter the desired value. By means of the buttons, the value can then be altered. Pressing **Enter** accepts the value. These values are saved with each thermal image and can be displayed and, if necessary, changed when later processing the thermograms by means of the analysis software IRBIS®.

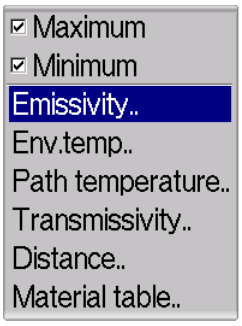


Fig. 95 Menu "Measure" - "Emissivity.."

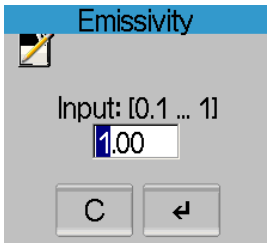


Fig. 96 Dialogue "Emissivity"

The standard setting of Emissivity is 1.00. This assumes that 100% of the radiation measured is irradiated by the measured object itself. The measured object represents the “ideal black body radiator” and does not reflect.

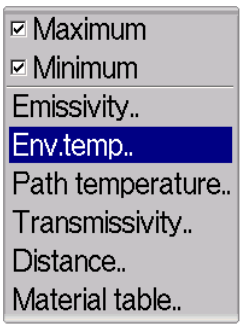


Fig. 97 Menu "Measure" - "Env.temp.."

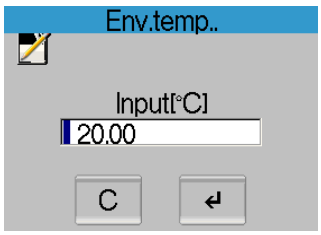


Fig. 98 Dialogue "Env.temp."

The ambient temperature is the temperature which the thermographic system detects via the more or less reflecting object to be measured. This temperature is not necessarily equal to the temperature of the thermographic system itself or that of its immediate environment.

A reduction of the emissivity below 1.00 will result in an effect of the ambient temperature onto the measured result. Therefore, it must be determined and entered in such a case at any rate.

Example: A low ambient temperature (e.g. cold night sky) makes a reflecting measuring object (e.g. windows in a house) appear colder to the thermographic system than it actually is. In the thermal image, windows (of lesser heat insulation) may at first sight appear colder – allegedly better heat-insulated – than the better insulated façade.

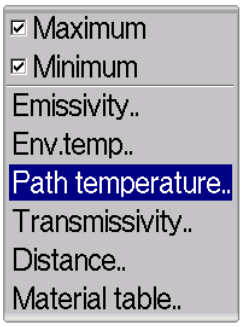


Fig. 99 Menu "Measure" - "Path temperature.."

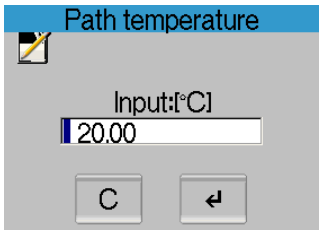


Fig. 100 Dialogue "Path temperature"

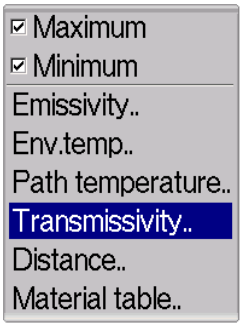


Fig. 101 Menu "Measure" - "Transmissivity.."

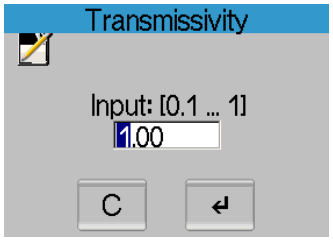


Fig. 102 Dialogue "Transmissivity"

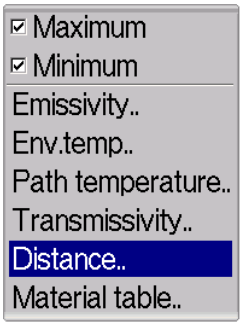


Fig. 103 Menu "Measure" - "Distance.."

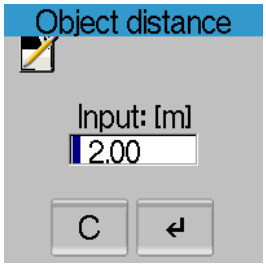
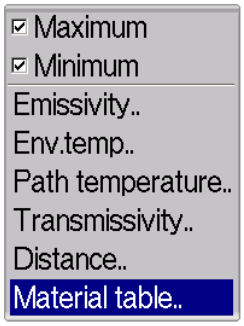


Fig. 104 Dialogue "Distance"

The thermographic camera VarioCAM® hr head works in the wavelength range from 7.5 to 14 µm. The impact of the atmosphere onto the measured result can be neglected in this range in most measurements – transmissivity is defined to be 1.00. Only in measurements over longer distances (from approx. 100 m) and/or through additional window materials, gases and fog, transmissivity decreases and the path temperature, transmissivity and distance should be determined and entered.

With the parameter distance, a preset value is generated depending on the current focussing, which only serves as rough orientation. The input of a distance has no effect on the focus adjustment!

Menu item "Material table"



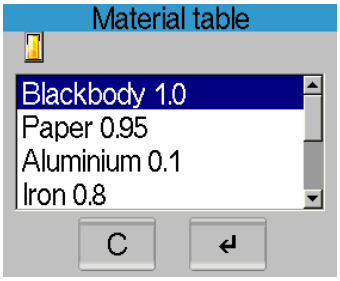


Fig. 105 Menu "Measure" - "Material table.." *Fig. 106 Dialogue "Material table"*

The menu item **"Material table.."** opens a dialogue (see Fig. 106) listing emission values of various materials. The appropriate material can be selected here. Afterwards the emissivity for the selected material is preset.

Tables regarding emission properties provide only rough orientation for the properties of the respective materials, since the emission properties depend on the actual nature of the surface (roughness, contamination, oxidisation...), on the angle to the surface normal, on the spectral range and surface temperature and, therefore, might strongly fluctuate!

9.6.4 Menu "Settings"

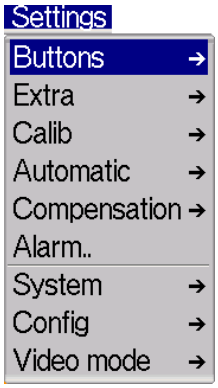


Fig. 107 Menu "Settings"

Fig. 107 shows the menu Settings. It includes all functions for setting the hardware of the VarioCAM® hr.

Menu item "Buttons"

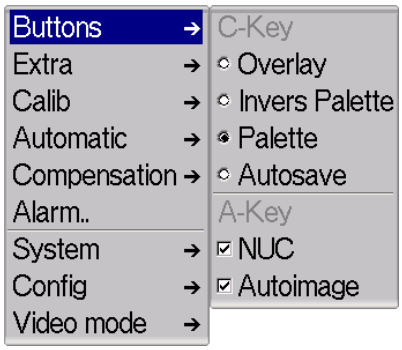


Fig. 108 Menu "Settings" - "Buttons"

Menu item **"Buttons"** serves to configure which actions shall be performed when hitting buttons **A** or **C**. For this purpose, the options **"NUC"** and **"Autoimage"** in the submenu can be activated or deactivated for **A**. For button **C** a variety of additional operations is available. An active option is checkmarked.

Following additional operations are at your disposal for button **C**:

- **Overlay** Hide and show function of the menu on the screen
- **Palette invert.** Inversion of current colour palette
- **Palette** The palette is displayed on the screen
- **Autosave** Activates the function **"Autosave"** (Menu item "Automatic" – Page 56)

"NUC" homogenises the image (**NUC**: **N**on **U**niformity **C**orrection). When correcting these low temperature deviations of the detector elements towards each other, which is due to technological reasons, the live display of the thermal image is briefly interrupted. The correction is performed by the system itself by changing the device temperature or within a fixed time interval or can be triggered by the user by hitting **A**.

The function **"Autoimage"** serves to automatically adjust the temperature level and range: According to the current temperature in the scene, the optimal setting of the temperature scale of the false-colour presentation is selected. This guarantees that all temperatures of the scene are imaged in the thermal image in colour or grey scales.

Menu item "Extra"

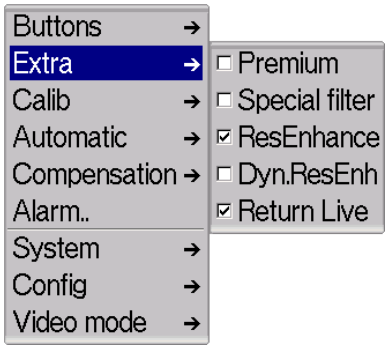


Fig. 109 Menu "Settings" - "Extra"

The menu item **"Premium"** activates image enhancement of the thermal images, for which immediately prior to saving the data an internal line-up of the detector elements is carried out and special image

filtering for reducing noise is performed. For using Premium saving, the function is to be activated in the menu and the data are to be saved by **SL** out of the live mode.

The menu item **"ResEnhanc"*** (Resolution Enhancement) activates a hardware-based, resolution-improving recording method. The thermal image is optically scanned several times, whereas, by shifting the pixel allocation by respectively half the pixel width, the geometric resolution of (384 x 288) is increased to (768 x 576) or from (640 x 480) to (1,280 x 960) pixels, accordingly (micro-scanning). Using the Resolution Enhancement function requires the fixed positioning of the thermographic system (tripod) and only makes sense to be applied to fixed objects to be measured at a constant temperature.

The menu item **"DynResEnh"*** (Dynamic Resolution Enhancement) activates a software-based image improvement method. Using this feature requires special analysis tools*.

The menu item **"Return Live"** is enabled by default. After having activated the focus mode the camera takes you back to the live mode by default after approx. 10 seconds. If this function is deactivated the camera stays in focus mode until the menu will be exited by choosing **E**nter.

Activated functions are respectively checkmarked in the menu.

Menu item "Calib"

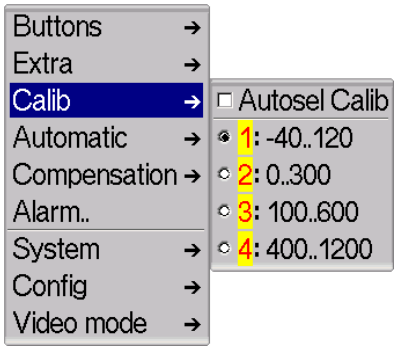


Fig. 110 Menu "Settings" – "Calib"

Available calibration ranges in the VarioCAM® hr head are listed in the submenu "Calib" (see Fig. 110) and, by respectively selecting them, permit toggling between them. The number of calibration ranges is dependent on the version of equipment. Also after delivery of the thermographic system, the temperature measurement range can be extended further by hardware extensions and further calibrations of the system or measuring can be performed using additional lenses.

The yellow-marked No. of the calibration range shows that, for the currently attached lens, valid calibration data are available in the thermographic system. Thereby, the type and serial number of the lens are checked. Should no valid calibration data be available for the attached lens, the system will mark all available data by shading the No. of the calibration range either light-red (calibration data for similar type of lens, no accordance with serial number) or dark-red (neither the type of lens nor the serial number conform to available calibration data). Apart from the No. of the calibration range, also the status window (above the colour palette) will be shaded light-red or dark-red accordingly. During operation of the system, this helps visualise at all times if valid calibration data are missing, regardless of having to check the calibration range in the menu Settings.

Menu item "Automatic"

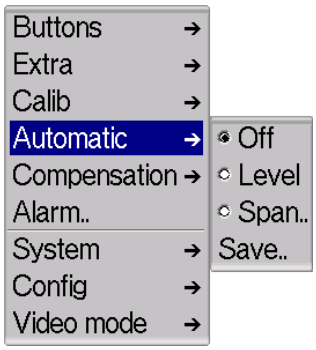


Fig. 111 Menu "Settings" – "Automatic"

Menu item **"Automatic"** comprises available automatic functions of the thermographic camera.

Items **"Level"** or **"Range"**, respectively, serve the automatic adjustment of the thermal image with respect to the temperature level or temperature range used. The respective menu item is checkmarked if one of the two functions is active.

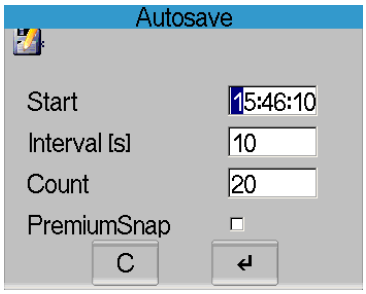


Fig. 112 Dialogue "Autosave"

When selecting **"Save.."**, a dialogue will appear to help record a sequence of thermal images.

The time of starting the recording needs to be entered into the field **"Start"**. As a preset value, the system provides the current time when calling up the dialogue for entering the parameters for automatic saving. Regardless of this, any desired start time between 00:00:00 and 23:59:59 can be set. Should the start time be set before the current time, the recording will immediately start upon activating this function.
"Interval" indicates in which period (hh:mm:ss) a thermal image is to be saved. The shortest possible interval is 0.5 s. Please note that the minimum recording period is also affected by the files to be saved (VIS*, Sceenshot) and by the possibly selected saving modes (e.g. Premium/ResEnh*).

Should shorter interval times be required for recording a sequence of thermal images, using the internal real-time memory* (see Menu "File" menu item “BG-memory“) is recommended.

The box **"Count"** indicates how many thermal images are to be saved/recorded. The maximum possible number is 99,999 images.

The box **"PremiumSnap"** indicates if the thermal images are to be saved in Premium mode (see Fig. 109, Menu "Settings" - "Extra") for reducing the noise in these thermal images.

The values in the various input boxes (figures) can be set by moving the joystick ↑ and ↓. Using the joystick ← and → serves to move among the positions in the input boxes. The **T** button (acting as a tab

key) is used to jump between the various input boxes. **Enter** saves the sequence settings. The settings will be dismissed and the dialogue exited if the **C** button is pressed.

When serial measuring is running, the filenames of the currently saved data are displayed.

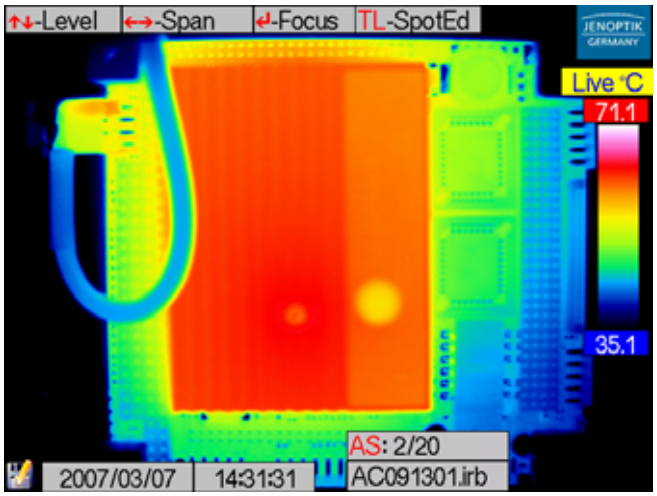


Fig. 113 Screen in "Autosave"

On-going serial measuring can be interrupted by **CL**.

Fig. 114 Dialogue – "Stop Autosave"

Menu item "Compensation"

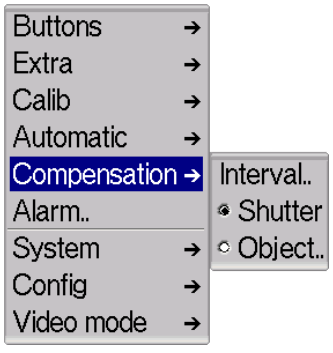


Fig. 115 Menu "Settings" - "Compensation"

This menu helps to adjust parameters for compensation.
If menu item **"Shutter"** has been selected, compensation is made with the shutter of the thermographic camera. The shutter is part of the optical mechanics. It is briefly swiveled into the beam path as a reference.

If menu item **"Object"** has been selected, compensation is made with the scene of the thermographic camera. The current setting is checkmarked in the menu.

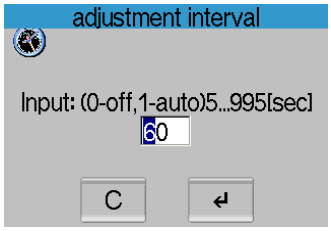


Fig. 116 Dialogue "Adjustment interval"

Via **"Interval.."**, the interval for automatic adjustment can be set (see Fig. 116). It displays the time in seconds, after which an automatic adjustment is to be performed. The interval to be entered can be between 5 sec and approx. 16 min (995 sec). Should the set value be outside these limits, it will automatically be adjusted. The recommended default setting is 60 s. However, a special case is the value 0, which switches the automatic adjustment off.

Menu item "Alarm.."

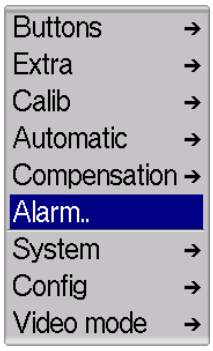


Fig. 117 Menu "Settings" - "Alarm.."

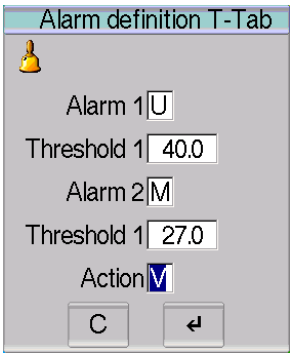


Fig. 118 Dialogue "Alarm definition"

Menu item **"Alarm.."** permits to define temperature thresholds. Should one of these threshold levels be reached, the alarm function selected from **"Action"** will be activated.

Should ROIs (see Chapter 9.4, Spot Editor*, page 34) have been generated in the thermal image, the alarm function will exclusively apply to this area.

Should no ROI have been generated in the thermal image, the alarm function will apply to the entire thermal image.

Two **alarm thresholds** can be defined.

In boxes **"Alarm 1/2"**, values exceeding **"U"** or falling short of **"D"** or reaching the mean value **"M"** for the temperature as set in **"Threshold 1/2"** can be determined.
The respective temperature threshold value relating to the respective box **"Alarm 1/2"** is entered into boxes **"Threshold 1/2"**.

In box **"Action"** it can be decided which action shall be taken in the case of alarm:

- **"S"** **S**ave – saves a thermal image
- **"V"** **V**isual display – displays the respective status (see Fig. 118 and Fig. 119)
- **"X"** E**x**ternal – transmits the alarm value in Kelvin via RS232* from the VarioCAM® hr
- **"A"** **A**coustic alarm

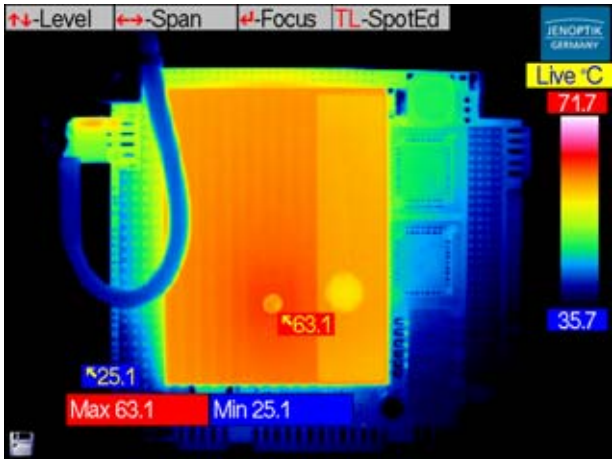


Fig. 119 Displayed visual alarm when exceeding and falling short (U/D) of the thresholds in the entire thermal image

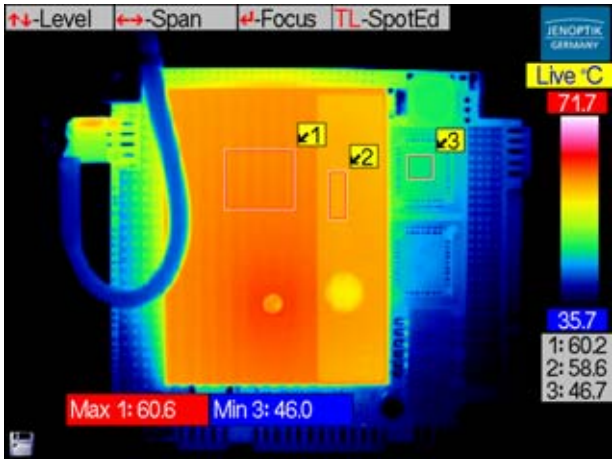


Fig. 120 Displayed visual alarm by exceeding the threshold in ROI 1 and by falling short of the threshold in ROI 3

Example for displaying temperature alarm via HyperTerminal

The HyperTerminal is a programme of the operating system and can be called up as follows:

- Start/Programs/Accessories/Communications/HyperTerminal

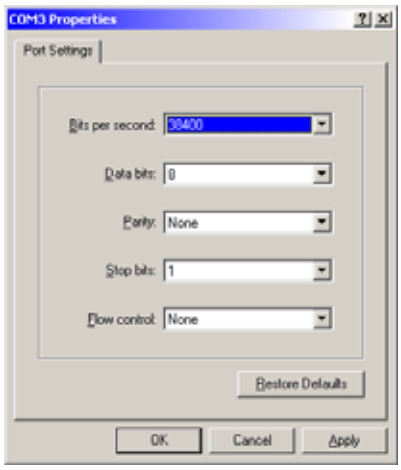


Fig. 121 HyperTerminal port settings

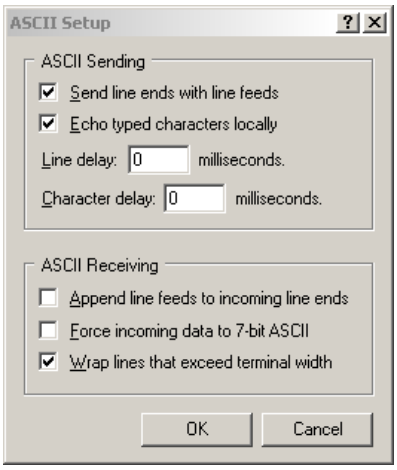


Fig. 122 recommended HyperTerminal ASCII configuration

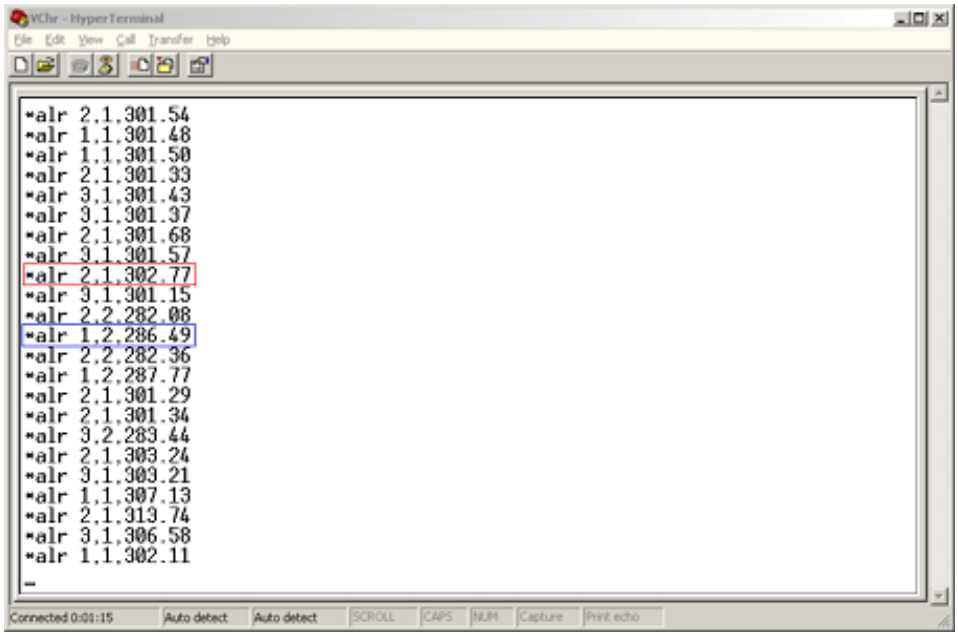


Fig. 123 HyperTerminal with data of the VarioCAM® high resolution

Temperature alarm data is output in the following way: **"alr"** + **"ID, resp. number of the measurement area (1 to 5)"** + **"alarm number (1/2)"** + **"current temperature in Kelvin"**. Two examples are highlighted in Fig. 123 referring to the alarm definitions in Fig. 118.

- **Red frame** Defined alarm condition 1 (exceeding threshold 1 with 28 °C) was met in measurement area 2. The current maximum temperature of measurement area 2 is 302.77 K = 29.62 °C.
- **Blue frame** Defined alarm condition 2 (deceeding threshold 2 with 15 °C) was met in measurement area 1. The current minimum temperature of measurement area 1 is 286.49 K = 13.34 °C.

Menu item "System"

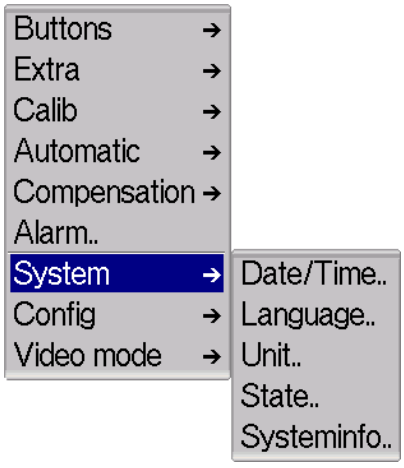


Fig. 124 Menu "Settings" - "System"

In menu item **"System"**, system settings can be changed.

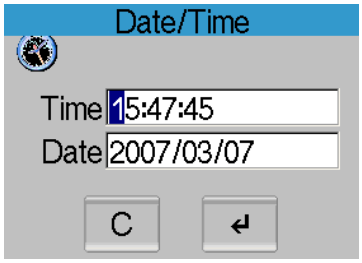


Fig. 125 Dialogue "Date/Time"

In menu item **"Date/Time.."**, the date and the current time are set.

Fig. 126 Dialogue "Select language"

In menu item **"Language.."**, the language for the graphical user interface of the VarioCAM® hr head is selected.

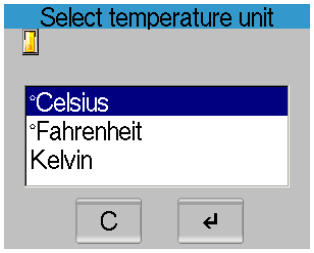


Fig. 127 Dialogue "Select temperature unit"

In menu item **"Unit.."**, selection can be made from among temperature units **"°Celsius"**, **"°Fahrenheit"** or **"Kelvin"**.

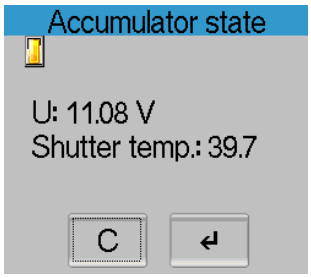


Fig. 128 Dialogue "Accumulator state"

Via menu item **"Battery.."**, the state of the accumulator can be checked. It shows the current voltage of the accumulator and the shutter temperature in a message box (see Fig. 128).

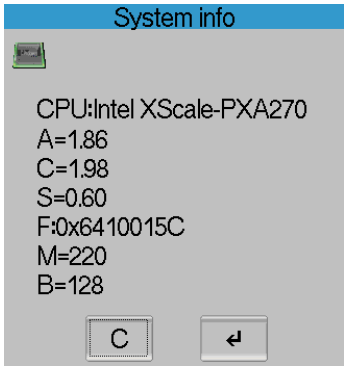


Fig. 129 Dialogue "System info"

In menu item **"Systeminfo.."**, system infirmation can be retrieved. By means of an abbreviation, the respective firmware is identified, followed by its current version:

- **A** Firmware of the CPU - version
- **C** Companion device driver - version
- **S** SSP device driver - Version
- **F** FPGA - version
- **M** OMI firmware - version
- **B** OMI Bootloader - version
- **GUID** ID-No.

Menu item "Config"

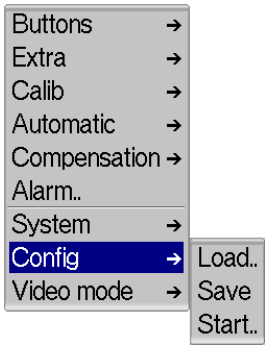


Fig. 130 Menu "Settings" – "Config"

The menu item **"Config"** allows to load and save the configuration of the thermographic camera, to make standard settings and firmware updates.

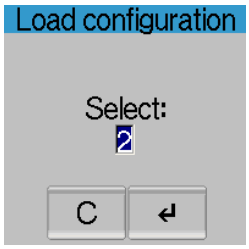


Fig. 131 Dialogue "Load configuration"

Menu item **"Load.."** permits to load a configuration (0 ... 5/9*).

Fig. 132 Dialogue "Save configuration"

Menu item **"Save"** serves to save the current configuration (1 ... 5/9*).

The number of configurations that can be saved is dependent on the version of equipment. Configuration 0 contains the default setting and cannot be overwritten.

Please note that loading the default setting will reverse all previously saved individual settings. The default settings define English to be the system language.

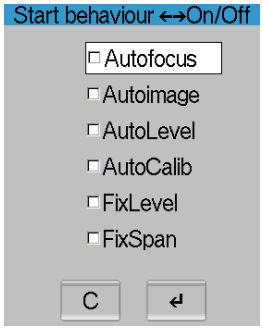


Fig. 133 Dialogue "Start behaviour"

By selecting the menu item **"Start.."**, a dialogue will be shown (see Fig. 133) in which the start behaviour of the thermographic camera can be determined:

- **"Autofocus"** VarioCAM® hr head performs autofocus.
- **"Autoimage"** VarioCAM® hr head adjusts the temperature range to the current measurement scene (Autoimage).
- **"AutoLevel"** VarioCAM® hr adjusts the temperature level to the current measurement scene (Autolevel).
- **"AutoCalib"** VarioCAM® hr head adjusts the calibration range according to the current temperature scene.
- **"FixLevel"** VarioCAM® hr head starts at the temperature level currently set in the configuration.
- **"FixSpan"** VarioCAM® hr head starts in the temperature range currently set in the configuration.

For saving the desired start settings press **Enter**, whereupon the dialogue will close. Subsequently, the respective configuration acc. to the dialogue in Fig. 132, Dialogue "Save configuration" page 62 is to be saved.

Menu item "Video mode"*

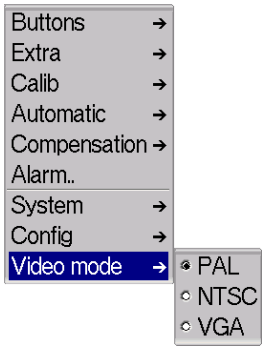


Fig. 134 Menu „Settings" - "Video mode"

In menu item “Video mode”, the video output of the thermographic camera can be changed.

10 Operating Software IRBIS® remote 3.0*

The IRBIS® remote software enables remote control of the VarioCAM® hr head as well as image transfer (based on the image displayed) via or onto a notebook/PC.

10.1 Programme Start

IRBIS® remote can be started either via the created desktop link or the programme link of the start menu.

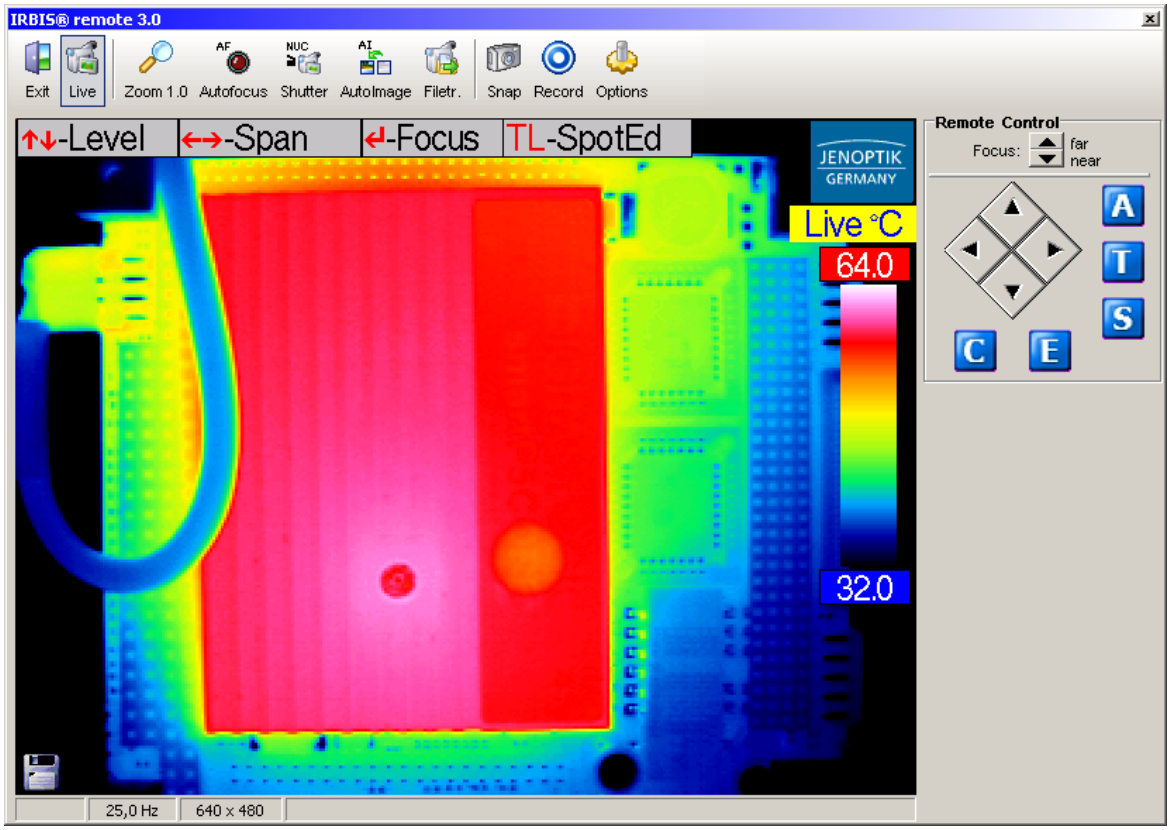


Fig. 135 IRBIS® remote FireWire connection as it appears on the screen

Please note that the data transfer rate of the programme is limited to max. 25 Hz. However, the frequency that can be displayed is dependent on the processor capacity and the graphic card of the computer involved.

When starting the programme, IRBIS® remote will check the connection to the thermographic system VarioCAM® hr. Should no connection be possible via the FireWire interface of the computer to the infrared camera, the programme will be trying, in a second step, to set up communication via the serial interface.

Fig. 136 IRBIS® remote – serial RS232 connection – as it appears on the screen

In the case of connection via the serial RS232 interface (Breakout Box* - see **Fehler! Verweisquelle konnte nicht gefunden werden.** – page **Fehler! Textmarke nicht definiert.**), only the keyboard commands will be transferred to the thermographic system. The video image can be visualised via video interfaces “S-Video”, “VGA” or “PAL/NTSC-FBAS” by means of a suitable replay device.

IRBIS® remote can only be used if the VarioCAM® hr head has been started and connected with the control PC.

10.2 User Interface

Depending on the activated components, the user interface menu will vary. The menu (see Fig. 135, page 64) is subdivided into three principal areas:

- Analog video display
- Menu bar with quick keys
- Controls for direct control

10.2.1 Analog Video Display

The area analog video display shows the video image as provided by the VarioCAM® hr. Interactive processing of the imaged elements within the display screen is not provided for and is not supported by the IRBIS® remote programme.
The size of the displayed image can be changed in fixed increments via the button “Zoom” (within the menu bar).

10.2.2 Menu Bar with Quick Keys

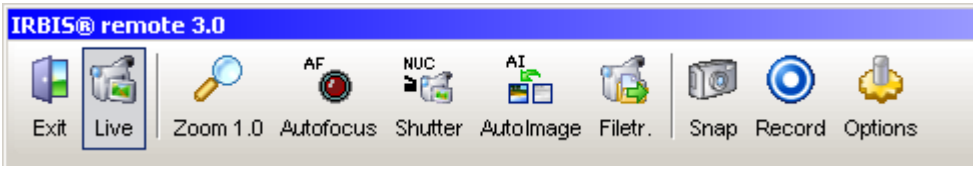


Fig. 137 Menu bar with quick keys

Please note that the active control elements are presented in a highlighting frame (see button “Live”).

Explanations for buttons

The main window as well as all opened roll-up windows below will be closed and IRBIS® remote will be exited.

Activating/deactivating the screen display.

Changing the imaging size (1.0 = 100 %).

VarioCAM® hr head performs the function autofocus.

VarioCAM® hr head performs correction (NUC - **N**on **U**niformity **C**orrection).

VarioCAM® hr head optimally adjusts the temperature level and range optimal to the current scene.

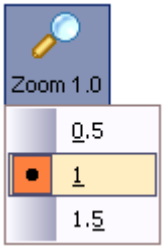
Data transfer of the data from the SD card in the infrared camera to the computer.

Snapshot/saving individual images of the image currently displayed on the computer.

Starts AVI recording on the computer.

Opens the window “Settings” where the parameters for saving single images, video recording and voice annotation are set.

Menu item “Zoom”



Menu item Zoom serves to toggle between defined zoom increments. The zoom increments available are dependent on the detector size and do vary.

Fig. 138 Setting zoom increments

Menu item “Recording”

Fig. 139 AVI recording started

Fig. 140 AVI recording paused

The AVI recording (**A**udio **V**ideo **I**nterleaved – video container format) can be continued by pressing the “Pause” button again.

10.2.3 Menu Item “Options”

Image options

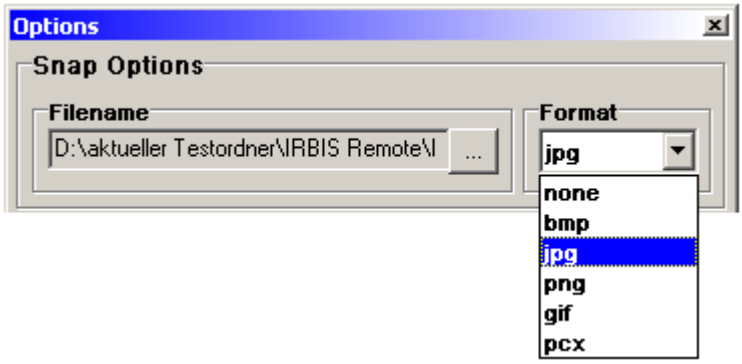


Fig. 141 Image options – setting the saving format for saving single images

Filename: Setting the filename and the memory path
Format: Setting the image format for saving single images

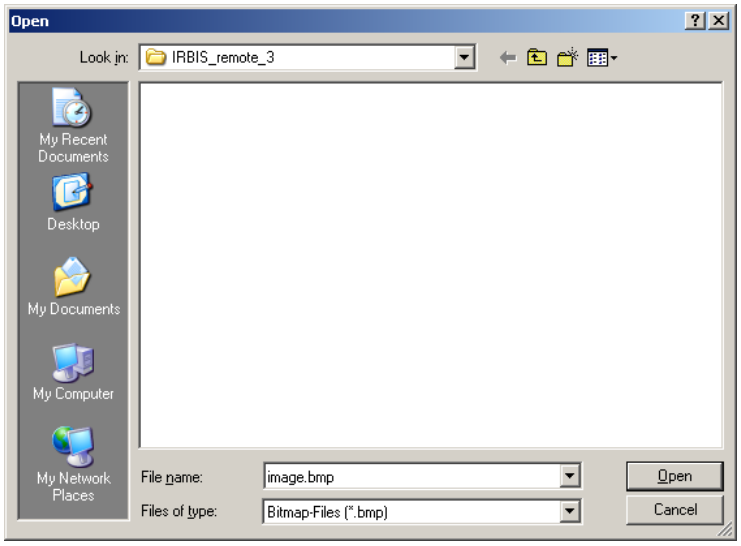


Fig. 142 Setting the memory path and the filename in the dialogue “Open”

Video options

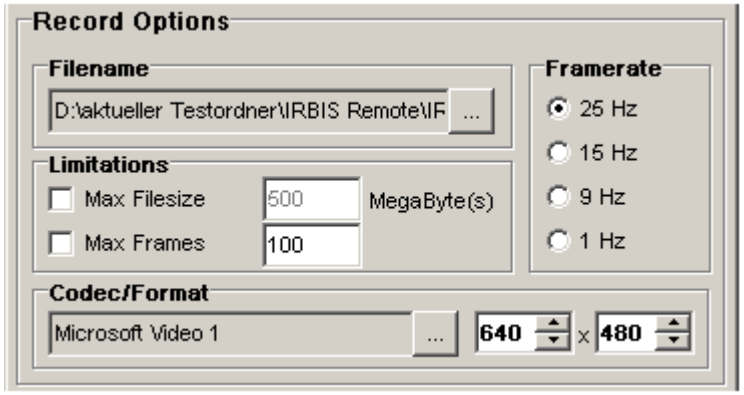
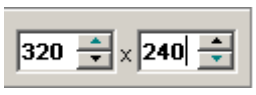


Fig. 143 Video options – settings for video recording

Filename: Setting the filename and the memory path
Framerates: Choice of AVI recording rate
Limitation: Max. file size in Megabyte per package file
Max. image count per package file

Has no choice been made in the box “Limitations”, a total AVI file of a size of max. 2 GB can be generated on the computer.

Codec/Format: Selection and parameterisation of the video codec
Setting the video image size



Please note that the IRBIS® remote software programme does not install any video compressing tools (video codecs) in the computer. In the selection box, you can find video codecs already located in the Operating System. Parameterisation possibilities are required by the respective codec and may vary.

The quality of the AVI file strongly depends on the selected video codec and the rate of compression.

Languages

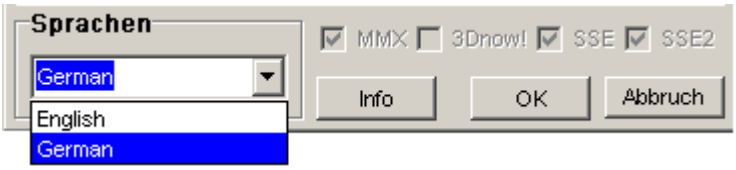


Fig. 144 Language settings

The IRBIS® remote software supports the languages “German” and “English”.

The boxes “MMX” (**M**ulti **M**edia E**x**tension), “3Dnow!”, “SSE” (**S**teaming **S**IMD **E**xtensions) and “SSE2” are read out by the programme and hint at available extensions of sets of commands which are of importance for data export.

10.2.4 Data Transfer

The dialogue shown in Fig. 145 is used for the transfer of the data saved on the SD card in the infrared camera VarioCAM® hr.

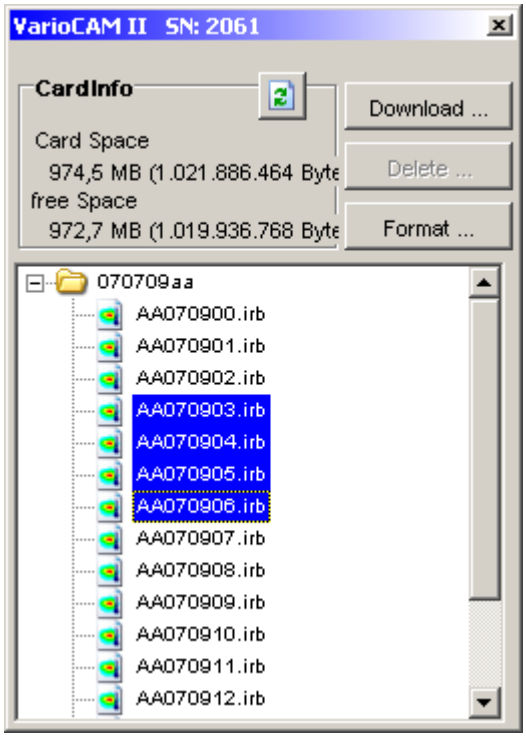


Fig. 145 Dialogue for data transfer

CardInfo The total capacity and the free capacity of the SD card in the VarioCAM® hr head are shown. The data and the file list can be updated via button  .

Download ... All files selected from the files from the file table can be copied to the harddisk. For this purpose, a dialogue is displayed in which the desired target directory is to be chosen.

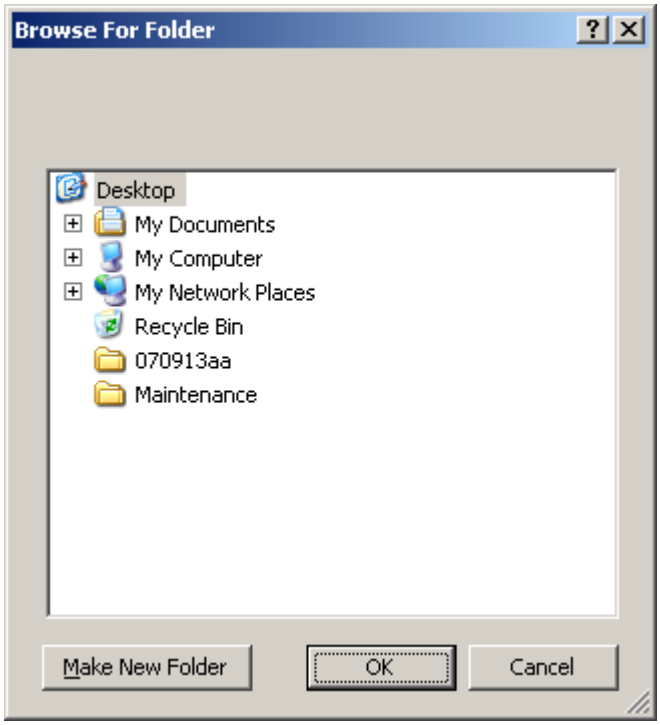


Fig. 146 Dialogue for selecting the directory for data transfer

The directory can be selected as is done in the Windows™ Explorer.

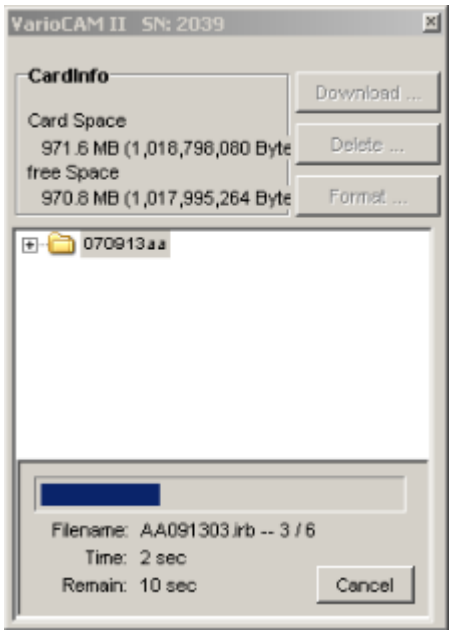


Fig. 147 Progress window during data transfer

Should several files be copied, a status window is displayed (see Fig. 147). Additionally, the currently required time and the still remaining time are shown. **" Cancel"** can disrupt data transfer. Transfer of the currently copied file will be completed.

Delete This function is deactivated.

Format The SD card inside the VarioCAM® hr head is being formatted.

All files are being erased from the SD card!

All functions provided for in the dialogue "Data transfer" have a direct effect on the SD card in de VarioCAM® hr.

Data is transferred either directly via the IEEE 1394 FireWire interface or via the RS232 interface. The FireWire data transfer of one simple thermal image (approx. 100 KB – depending on detector size) takes about one second. This time will increase if thermal images have been generated by the function "Resolution Enhancement“ or thermal images have been saved along with an integrated visual photo and/or integrated audio comment.

10.2.5 Controls for Direct Control

Fig. 149 Focussing the camera manually

Focussing the VarioCAM® hr head manually can also be performed outside the “Focus” mode.

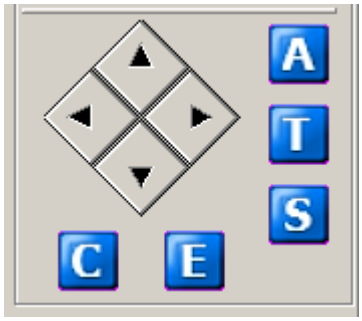


Fig. 150 Keypad for the VarioCAM® hr

The VarioCAM® hr head is remote-controlled via the keypad shown in Fig. 149.
Button **"E"** correlates with the camera function "Press key on the buttons“.

The buttons in rhomboid arrangement are assigned with the functions of the buttons of the VarioCAM® hr. Buttons **"A", "T", "S", "C"** and **"E"** correlate with the appropriate key functions on the infrared camera.

Thereby, the functions differ depending on the current work mode of the VarioCAM® hr head (see Chapter 8, from page 22).

10.2.6 Allocation of Functional Keys

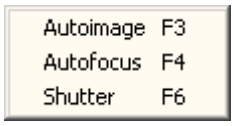


Fig. 150 Pop-up menu in the field of the analog video display

The following functional keys have been implemented in the IRBIS® remote software:

- (F3) Autoimage 

- (F4) Autofocus 

- (F6) Shutter 

11 Maintenance of the Device

11.1 Cleaning

Possible maintenance of the VarioCAM® hr head is limited to cleaning external surfaces only.

The optical surfaces of the lens have been coated with high-value optical films. Do not touch these surfaces and protect them against dust and from being damaged. If the device is not in use, protect the lens by putting on its protective cover.

Should cleaning the optical surfaces become necessary, please exclusively apply woodfree cotton wool or Professional Wipes Kleenex in combination with 96% ethanol.
If the device is heavily soiled, please turn to the manufacturer.

With the lens detached (during lens change), the opening of the camera housing is to be protected against any kind of touching its internal components. Please take care that no impurities will get into the camera. Any tampering with internal components of the thermographic camera is expressly prohibited.

Any maintenance and repair beyond any activities described in this User Manual must only be performed by authorised professionals. Any violation will void any warranty or any liability on the manufacturer's part.

11.2 Calibration

The system VarioCAM® hr head has very carefully been calibrated by the manufacturer, observing precision compliance with the National Normal.

It is recommended to have the calibration checked by the manufacturer or any other certified body approximately every two years. Along with this check, the device should undergo general maintenance with the manufacturer.

12 Environmental Protection

VarioCAM® hr head is an opto-electronical device that contains special infrared optics and electronic circuitry. These components require special disposal as soon as the device is no longer in use.

The manufacturer offers to take back from the customer the product VarioCAM® hr head in order to guarantee environmentally appropriate disposal after using the device.

In this event, please send the device to the address shown in → Chapter 13, Service – page 75.

13 Service

The manufacturer recommends maintenance of the system VarioCAM® hr head by its Customer Service approximately every two years.

The manufacturer guarantees to perform service of the product VarioCAM® hr.

In the event of any disturbances or for technical maintenance, please contact your sales representative or our Customer Service at the following address:

InfraTec GmbH
Infrarotsensorik and Messtechnik
Gostritzer Straße 61 - 63
01217 Dresden
GERMANY

Phone: **+49 351 871-8615**
Fax: **+49 351 871-8727**
E-mail: **service@InfraTec.de**
www.InfraTec.de

14 Index